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VOLUME 2:
DELTA VISION STRATEGIC PLAN

Fifth Staff Draft

**CONTENT HAS NOT BEEN APPROVED BY DELTA VISION BLUE RIBBON TASK
FORCE OR DELTA VISION COMMITTEE**

October 9, 2008

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1 **Volume 2: Strategy Descriptions**

- 2 The following descriptions offer greater detail on the specific strategies and actions
3 proposed in this Strategic Plan.
- 4 For the context and overall strategic direction in which these strategies should be
5 understood, please refer to Volume 1.

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Goal 1: Legally acknowledge the co-equal status of restoring the Delta ecosystem and creating a more reliable water supply for California

Strategy 1.1: Make the co-equal goal the foundation of Delta and water policy making

Achieving the co-equal goal of restoring the Delta ecosystem and creating a more reliable water supply for California was the first recommendation of the 2007 Vision. It is also the first goal of this strategic plan.

The co-equal goal must be fully institutionalized in California policy making; it cannot be an occasional commitment. To this end, formal approaches are critical. Constitutions, statutes and financing structures provide authority and responsibility. Effective leadership can use legal authorities and financing systems to great advantage and legal responsibility for a function and an on-going financing stream will maintain effort over many years. Recommendations on governance structures and strategic finance are in Goal 7. The recommendations here are separate, critical actions.

Actions recommended:

1.1.1. Write the co-equal goals into the California constitution.

1.1.2. Write the co-equal goal into statute, and incorporate the co-equal goal into the mandated duties and responsibilities of all state agencies with significant involvement in the Delta.

1.1.3. Require the achievement or advancement of the co-equal goal in all water, environmental and other bonds that directly or indirectly fund activities in the Delta.

Vision Recommendations Met

1

Performance Measure

Integration of ecosystem and water policies
(+)

Goal 2: Recognize and enhance the unique cultural, recreational, and agricultural values of the Delta as an evolving place, an action critical to achieving our co-equal goals.

Strategy 2.1. Apply for federal designation of the Delta as a National Heritage Area, and establish a multi-site State Recreation Area in the Delta.

The Task Force's November 2007 Vision document described the Delta as "a unique and valued area, warranting recognition and special legal status from the state of California." Despite the risks and inevitable changes that will confront the Delta in the coming decades, this Strategic Plan is premised on recognition of the Delta's unique natural, cultural and historic character, rather than abandonment of the region. Such recognition is warranted at a national as well as state level.

The Delta is the "third leg of the stool," along with the two co-equal goals, in forming the foundation for the Strategic Plan. State and federal recognition of the Delta should support the Delta as a place—regardless of any other actions on the environment and water supply.

Any designation of the Delta should be structured to increase the visibility of the Delta within the state of California and nationally. It should strengthen the recreational, tourist and agricultural economies in the Delta. And as the recommendations of Delta Vision and other initiatives are implemented, priority should be given to Delta institutions and businesses whenever possible.

The critical elements of our strategy for designating the Delta include:

2.1.1. Apply for the designation of the Delta as a federally recognized National Heritage Area by 2010, through the three major steps described below. National Heritage Areas are places designated by the Congress "where natural, cultural and recreational resources combine to form a cohesive, nationally-distinctive landscape arising from patterns of human activity shaped by geography."

Despite being a federal designation, heritage areas do not involve any federal ownership or regulation of land. The National Park Service and the Department of the Interior review proposed heritage area management plans to see that intended actions advance the mission of the Park Service and the National Heritage Area program. Otherwise, the federal role is limited to partnering in marketing efforts.

Vision Recommendations Met

2, 9

Performance Measure

Application steps completed for special designations (+)

- 1 **a.** Beginning immediately, the Delta Protection Commission (DPC) and interested local
2 entities should secure public support within the Delta for the designation. They should
3 jointly conduct the required feasibility study, and identify the appropriate agency or non-
4 profit to serve as the ongoing management entity.
- 5 **b.** Upon completion of the feasibility study, the state and the heritage area's management
6 entity should apply to Congress for the designation.
- 7 **c.** Upon receiving the designation, the management entity and its partners must develop a
8 plan within three years that describes how the heritage area will combine preservation,
9 recreation, economic development, tourism, and heritage education to interpret and
10 promote the region's distinctive landscape.

11 **2.1.2. Create by 2010 a multi-site State Recreation Area in the Delta, combining**
12 **existing and newly designated areas.**

13 Beginning immediately, the California Department of Parks & Recreation should initiate a
14 feasibility and siting study that considers at least the following:

- 15 **a.** A southern recreation area on Sherman Island, located somewhere that is visible from
16 the Antioch Bridge, is easily accessible from Highway 160, and potentially allows cost-
17 effective levee upgrades to protect the recreation site and major electricity and natural
18 gas infrastructure;
- 19 **b.** A site that is readily accessible to populations living to the north of the Delta;
- 20 **c.** Consolidating Brannan Island State Recreation Area, Franks Tract State Recreation
21 Area, and Delta Meadows River Park with the new recreation area.

1 **Strategy 2.2: Establish market incentives and infrastructure to protect,**
2 **refocus and enhance the economic and public values of Delta**
3 **agriculture.**

4 The Delta is already a highly productive agricultural area, but the state must support
5 continued innovation and diversification of production, and help develop marketing
6 opportunities, so that agriculture can continue to thrive in the Delta of the future.

7 Market forces will largely guide agricultural
8 activity in the future, and Delta farmers will
9 continue to be the best judges of agricultural
10 business opportunities. But the Delta is uniquely
11 suited for several kinds of specialized
12 agriculture that advance public values. Special
13 incentives should be created for farmers to
14 pursue these opportunities profitably and
15 sustainably.

16 There are several examples already in practice.
17 Farmers on Staten Island grow grains in a
18 manner that supports populations of sandhill
19 cranes and other migratory birds. Much of the
20 Yolo Bypass is farmed even as it stands ready
21 to divert flood waters from the Sacramento
22 River. And many farms in the Delta contain
23 recreation and tourism enterprises, such as
24 wine tasting or U-Pick farms.

25 Perhaps the most promising long-range opportunity is the potential farming of tules and
26 other wetland plants that can absorb carbon from the atmosphere and raise land elevations.
27 California's regulatory efforts to curb greenhouse gas emission should establish a market for
28 carbon, so that Delta farmers can profit from absorbing carbon – and making the entire
29 region more sustainable in the process.

30 All of these creative farming techniques – and others that may not even be known today –
31 should be supported to take their place alongside traditional agricultural industries.

32 The critical actions of this strategy include:

33 **2.2.1. Create special Delta designations within existing federal and state**
34 **agricultural support programs.**

35 This should include:

- 36 **a.** Partnering the California Department of Food and Agriculture with commodity boards,
37 and local governments and use U.S. Department of Agriculture (USDA) Farm Bill
38 funding to begin a regional labeling program and assist in the direct marketing of Delta
39 produce in nearby cities.
- 40 **b.** Delta local governments and agricultural institutions should assess the opportunities in
41 the new USDA Farm Bill for funding that supports agricultural marketing including
42 labeling, direct marketing and the development of new crops, crop varieties, and value-

Vision Recommendations Met

2, 9

Performance Measures

Gross regional product from agriculture (+)

Gross regional product from sustainable
agriculture (+)

Acres of land providing public benefits of
habitat, flood conveyance, subsidence
reversal, or carbon sequestration (+)

1 added products. Among the Farm Bill titles that should be assessed are Research,
2 Conservation, Rural Development, Energy, and Nutrition. Appropriate collaborations with
3 the Delta Protection Commission, the Delta Conservancy, and state and local
4 agricultural institutions should be formed to apply for and secure funding from these and
5 other Farm Bill titles, and foundations.

6 **c.** Leveraging the conservation funding available through the federal Farm Bill, such as that
7 available through the Cooperative Conservation Partnership Initiative, by using the
8 state's working lands conservation programs.

9 **d.** Requiring the Delta Protection Commission to continue working with the USDA to secure
10 funding for a Resource Conservation and Development Council to promote natural
11 resource-based economic development. Among other functions, the council should
12 develop housing for agricultural laborers in and around the Delta.

13 **2.2.2. Conduct needed research and development for agricultural sustainability in** 14 **the Delta.**

15 This should include:

16 **a.** Conducting a Delta-wide study — similar to that done by the University of California's
17 Agricultural Issues Center for Solano County — in which barriers and opportunities to
18 improve agricultural sustainability are identified through economic analysis and
19 stakeholder interviews. The study should include an assessment of the potential to
20 achieve habitat and water management objectives while continuing to farm in potential
21 restoration areas.

22 **b.** Increasing the University of California's research and extension capacity in the Delta as
23 well as the technical field staff of the U.S. Department of Agriculture's Natural Resources
24 Conservation Service, to explore the use of crops that slow or reverse subsidence,
25 improve water use efficiency and quality, are wildlife-friendly, and improve floodplain
26 management.

27 **2.2.3. Establish new markets for innovative agricultural products and enterprises** 28 **in the Delta.**

29 This should include:

30 **a.** Ensuring that carbon farming is officially recognized as an emissions reduction
31 mechanism under California's Global Warming Solutions Act (AB 32), and that
32 appropriate carbon trading mechanisms are created to permit Delta farmers to enter into
33 contracts with carbon emitters.

34 **b.** Creating federal, state and local mitigation requirements and agricultural easement
35 programs that support the transition of Delta growers to multifunctional forms of
36 agriculture, particularly ones that help wildlife habitat and flood management.

37 **c.** Devising protection strategies for farmlands threatened by urbanization through
38 conservation easements, Williamson Act contracts, and "transfer of development rights"
39 arrangements.

Strategy 2.3: Develop a regional economic plan to support increased investment in agriculture, recreation, tourism, and other resilient land uses.

The Delta economy presents important opportunities for innovation. The agricultural and recreational economies both occupy important – and unique – niches in the larger economy of California. Economic development planning is required if the Delta is to take full advantage of these opportunities.

Agriculture, recreation and tourism are the mainstays of the regional economy, and will remain so. However, innovative, high-value land uses should also be encouraged, especially those that contribute to levee financing and local tax rolls and do not increase flood risks. On-island water storage, on-island flood storage, materials handling, and other non-traditional land uses may play an important role in the future Delta. The plan should assess these opportunities and recommend means to encourage them, if appropriate.

Vision Recommendations Met

2, 9

Performance Measure

Gross regional product from recreation and tourism (+)

The plan should also address the location of future projects with respect to disaster risks. Though recreation and tourism should be enhanced throughout the Delta, the buildings and services required to expand the industry should be concentrated in highly visible locations near highways and population centers — and in areas with relatively low disaster risks such as those above sea level or protected by high-quality levees.

2.3.1 Charge the Delta Protection Commission with facilitating a consortium of local governments to create a regional economic development plan that addresses agriculture, recreation, tourism, and other innovative land uses.

- a. Require the plan to have active stakeholder participation from business owners, land owners, farm bureaus, and other local institutions.
- b. Require the plan to identify strategies that will strengthen the Delta economy, including agriculture, even if significant changes occur to the Delta land form, to water infrastructure, or to west Delta water quality.

2.3.2 As part of the economic development plan, establish special enterprise zones at the major “gateways” to the Delta.

- a. By 2010, the Governor’s Office of Planning Research should issue a model ordinance to local governments to create these zones.
- b. By 2013, the Legislature should pass a law providing tax breaks and/or low-interest loans within these zones to spur investment in welcome centers, interpretive centers, recreational support services, and land and water transportation from these locations to points of interest throughout the region.

- 1 **c.** There should be at least one gateway on each of the four sides of the Delta to ensure
- 2 visibility and access. Potential sites for such gateways include Rio Vista in the west.
- 3 Freeport, West Sacramento or the Yolo Bypass to on the north. Stockton in the east.
- 4 And Antioch, Discovery Bay or Lathrop to on the south.

Strategy 2.4: Establish a Delta Investment Fund to provide funds for regional economic development and adaptation.

The Delta will change in the future due to population growth, climate change, and other forces. It is critical that the Delta economy retain the vitality and resiliency needed to meet these challenges. Delta agriculture, tourism, recreation, and other industries will need to have access to new sources of investment and funding so that they may diversify and innovate.

As the state makes major investments in ecosystem restoration and water supply reliability, there should also be investment in the vitality of the Delta economy. The Delta has special cultural and historical value, but that does not make it a museum. It deserves and requires a healthy economy that can grow and change as new circumstances arise in the future. The Delta Investment Fund will provide a funding and credit base to sponsor the growth of such an economy.

The critical actions for this strategy are:

2.4.1 Initiate the Delta Investment Fund with state funding.

Possible funding mechanisms include a general obligation bond (perhaps as part of a large bond measure to fund Delta restoration and water infrastructure improvements) or a general fund appropriation.

2.4.2 Structure the fund so that it can accept revenues from state, local and private sources.

The fund should be able to draw from diverse sources to ensure long-term stability and prevent a “boom-and-bust” pattern from bonds alone.

2.4.3 Place the Fund under the joint management of the Delta Protection Commission and a consortium of local governments.

Require that the funds be expended in a manner consistent with the CDEW Plan (see Strategy 7.2).

Vision Recommendations Met

2, 9

Performance Measures

Gross regional product from recreation and tourism (+)

Gross regional product from sustainable agriculture (+)

Success rate of small and new Delta businesses (+)

1 **Strategy 2.5: Adopt land use policies that enhance the Delta’s unique**
2 **values, and that are compatible with the public safety, levee, and**
3 **infrastructure strategies of Goal 6.**

4 The Delta and its residents are threatened by widespread urbanization of the secondary
5 zone. Development of low-lying lands not only places people at flood risk, but also may
6 inadvertently increase stress on existing levees. Strategy 6.2 recommends new Delta land
7 use policies intended to avoid these dangerous outcomes. Strategy 7.1 describes the
8 needed enhancements of the Delta Protection Commission. (Please consult these strategy
9 descriptions for details on proposed strategies pertaining to land use.)

10 These land use policies also have important
11 consequences for the Delta as a place. New
12 urbanization within the geographical areas
13 identified in Strategy 6.2 would significantly
14 change the social and visual character of the
15 Delta. Delta residents value the small scale of
16 their local communities, and in general do not
17 wish to see them transformed into “bedroom”
18 communities. In order to keep the existing
19 towns and rural areas economically vital,
20 however, a small amount physical growth may
21 be necessary in the legacy towns.

Vision Recommendations Met

2, 9

Performance Measures

See Strategy 6.2

22 As population growth transforms the Central
23 Valley in the coming decades, the Delta’s rural character also will be an important part of its
24 appeal as a recreational destination. Large scale urbanization interferes with that rural
25 character.

26 Finally, large-scale urbanization, especially of floodplains and lands at or near sea level,
27 would compromise the ecological quality of the Delta. These lands are irreplaceable for
28 purposes of tidal marsh restoration, floodplain habitat restoration, and sea level rise
29 accommodation. Opportunities for such restoration would be thwarted by urbanization. See
30 Strategy 3.1 for specific recommendations on this subject.

Goal 3: Restore the Delta as the heart of a healthy estuary

Strategy 3.1: Restore a large area of interconnected habitats – on the order of 100,000 acres — within the Delta and its watershed, over time.

Revitalizing the Delta ecosystem cannot be implemented piecemeal. Creating a diverse mosaic of connected habitats is the cornerstone upon which this restoration strategy is built. To do so, this strategy calls for restoration of selected intertidal marshes, seasonal floodplains, and open water embayments. These habitats must be connected to one another and to adjacent upland areas that support grasslands and seasonal wetlands, including vernal pools.

Revitalization efforts must focus on water, land, and the intersections between the two. The Delta ecosystem is not just fish. Vast migrations of waterfowl and shorebirds, many protected by state and federal laws and international treaties, depend upon the Delta. Millions of migrating birds either pass through, or stay the winter in, the Delta. Since about 95 percent of California's original wetlands have been lost, those that remain are vital to the survival of these birds. There are also many land-based species in the region that require conservation attention. Protecting the wetlands, grasslands, forests, and farmlands that all of these birds and animals depend upon is essential. Proper connections between these habitats should also be ensured.

Ecosystem vitality must also be ensured through wise land use planning. Upland areas adjacent to restored intertidal marshlands must be protected so that as the sea level rises, marshlands can migrate landward and continue to fulfill their important ecosystem functions. These lands are located around the entire perimeter of the Delta. Priority should be placed where intertidal marsh restoration is most feasible in the shortest time.

In September 2007, the CALFED Independent Science Board recommended that planning for critical Delta facilities and services use a 55 inch sea level rise projection by the year 2100. This considers more recent scientific information than was available when the California Climate Action Team Report estimated a 12 inch to 36 inch increase in 2006. Recognizing the great uncertainty in these projections and that sea level rise will continue beyond the year 2100, Delta Vision is assuming 60 inches (5 feet) of projected sea level rise for purposes of long term planning.

Vision Recommendations Met

1, 3

Performance Measures

Acres of restored tidal marsh, Delta (not accounting for sea level rise) (+)

Acres of restored tidal marsh, Suisun (not accounting for sea level rise) (+)

Acres of restored shallow open water habitat in the Delta (+)

Acres of active floodplain (+)

Acres of seasonal wetlands and grasslands (+)

Acres of fall open water habitat between 0.5-6 parts per thousand salinity (+)

Percent of aquatic food web support by diatoms (+)

Number and geographic distribution of large habitat complexes incorporating two or more interconnected habitat types (+)

1 How the Delta ecosystem will respond to revitalization efforts cannot be predicted with
2 precision. Final outcomes are further clouded by the impact climate change, sea level rise,
3 population growth and seismic activity. But initial experiences in some recent large-scale
4 restorations, such as in the Yolo Bypass, suggest positive results. The amount and type of
5 restoration ultimately needed can be determined only through a rigorous adaptive
6 management framework overseen by the CDEW Council (see Strategy 7.1).

8 All restoration and associated scientific
10 monitoring and research efforts must follow
12 the CDEW Plan. The Delta Science and
14 Engineering Board must review and approve
16 design, research, and monitoring programs
18 for consistency with these plans. Any
20 restoration efforts implemented prior to
22 establishment of the CDEW Plan shall be
24 reviewed by the CALED Science Program
26 and the ERP Implementing Agencies
28 (CDFG, USFWS, NMFS) for consistency
30 with the Draft ERP Stage 2 Conservation
32 Strategy and existing monitoring and
34 research priorities and science as described
36 in the DRERIP Delta Conceptual Models.

To focus public policy processes on the types and scales of restoration needed, targets for several types of habitat are proposed. In most cases these targets are derived from the best available analyses of the Delta, largely organized through CALFED, but have not yet been tested through discussion in public policy processes or full scientific review. The needed scientific review can be completed in a relatively short time period concurrent with the policy making process. Initiating action is critical and will provide improved information for policy making over time.

37 Studies and restoration work would be carried out by the Delta Conservancy (described
38 below under Goal 7), the California Department of Fish and Game (DFG), the U.S. Fish and
39 Wildlife Service (USFWS), the Department of Water Resources (DWR), the federal Bureau
40 of Reclamation (Reclamation), the Delta Engineering and Science Board, and various
41 scientific research organizations. (See strategy 7.1)

42 The key elements of this strategy are:

43 **3.1.1. Increase the frequency of floodplain inundation and establish new** 44 **floodplains.**

45 Floodplains provide ecosystem benefits as well as flood management benefits and improve
46 levee protections downstream by reducing peak flood stages. Expanding floodplains also
47 may allow upstream reservoirs to be managed more flexibly, which could increase water
48 supply yield (see Strategy 5.2).

49 The floodplains of the San Joaquin and Mokelumne River are threatened by urbanization
50 that would put people at risk and severely limit restoration opportunities. The land use
51 controls that we recommend to address this problem are described in Strategy 6.2.

- 52 **a. Sacramento River/Yolo Bypass. Increase interannual inundation frequency on the**
53 **Yolo Bypass by 2015 without compromising flood protection.** Modify Fremont Weir
54 and other internal waterway features as needed to allow the Yolo Bypass achieve two
55 conditions to the extent possible: (1) Flood at least 60 days continuously between
56 January and April every other year except during critical dry years, and (2) Provide
57 multiple inflow pulses at two-to-three week intervals during this inundation period. These
58 conditions promote primary and secondary productivity, splittail spawning, and other
59 benefits. Improvements should ease passage impediments to adult and juvenile salmon,
60 sturgeon, and splittail at the Fremont Weir, Lisbon Weir, Toe Drain, and other barrier

1 points. These actions will be balanced with existing fish and wildlife benefits provided in
2 the bypass.

- 3 **b. Mokelumne River. Establish by 2015 new seasonal floodplains where the**
4 **Mokelumne River enters the Delta.** Place under management or acquire the
5 necessary land and update the Draft North Delta Flood Protection Environmental Impact
6 Report for Staten Island and McCormick-Williamson Tract to provide for integrated
7 seasonal floodplain habitat, linkage to planned adjacent intertidal marsh, and additional
8 flood protection for lands along the lower Mokelumne and Cosumnes River corridors.
9 Investigate incorporating the northern portion of New Hope Tract into the flood corridor.
- 10 **c. San Joaquin River. Immediately establish a lower San Joaquin River floodplain**
11 **below Vernalis and along Old River to Fabian Tract.** Identify suitable lands by
12 examining San Joaquin River flows, channel flood flow capacity, options for flood bypass
13 configurations, and land surface elevations needed to provide both seasonal floodplain
14 habitat and flood protection.
- 15 **d. Upstream Floodplains. Investigate, and implement by 2015 where feasible,**
16 **additional floodplain habitat along all rivers and streams entering the Delta**
17 **capable of supporting salmonid rearing and splittail reproduction.** Identify suitable
18 lands in the context of available flows, channel carrying capacity, and land surface
19 elevations needed to provide seasonal floodplain habitat and flood protection.

20 **3.1.2. Restore tidal habitats and protect adjacent grasslands and farmlands** 21 **throughout the Delta, with active near-term pursuit of restoration targets.**

- 22 **a. Restore intertidal marsh.** (See Figure 7.) The amount of tidal marsh restoration for the
23 Delta and Suisun Marsh has been estimated by previous studies and re-examined by
24 the Task Force. Various conclusions have been made about how much tidal marsh
25 restoration is needed for the Delta and Suisun Marsh. The 2000 CALFED Record of
26 Decision and the Suisun Marsh Plan currently under development call for restoration of
27 7,000 to 9,000 acres in Suisun. The 1999 Suisun Marsh Habitat Goals Report suggested
28 17,000 to 22,000 acres. The 2006 Central Valley Joint Venture Habitat Management
29 Plan said 23,000 acres could be restored without adversely affecting target waterfowl
30 populations. The Task Force recommends a near-term and longer term approach with
31 the following components:
 - 32 **i.** Restore, in the near term, approximately 15,000 acres of intertidal marsh in the Delta
33 by 2020. Give priority to locations with the greatest anticipated benefit to the
34 ecosystem and the highest feasibility for successful restoration.
 - 35 **ii.** Restore up to an additional 15,000 acres of intertidal marsh in the Delta by 2040. If
36 adaptive management monitoring indicates prior restoration and other activities have
37 not yet accomplished ecosystem goals, restore as much remaining land of suitable
38 elevation as possible by 2060.
 - 39 **iii.** Restore 12,500 acres of intertidal marsh, approximately 20 to 25 percent of the diked
40 lands, in Suisun Marsh by 2020.
 - 41 **iv.** Restore another 12,500 acres of intertidal marsh in Suisun Marsh by 2040. Add more
42 acreage as lands become available, if adaptive management monitoring indicates
43 prior restoration and other activities have not yet accomplished ecosystem goals.

1 **b. Restore tidal open water areas, if new studies show it to be effective.** Large, open
2 water areas with broad tidal connectivity to Delta waterways have the potential to
3 provide pelagic habitats important for several fish and diving duck species, and to
4 provide desirable and accessible food web productivity. However, it is also important to
5 ensure that such areas do not become dominated by harmful invasive species of fish or
6 vegetation.

7 **i. Complete studies by 2015 to address harmful invasive species interference.**

8 The CALFED Science Program and Ecosystem Restoration Program agencies are
9 examining the most effective strategies for restoring tidal open water embayments in
10 the Delta to increase diatom-based productivity and minimize the adverse effects of
11 harmful invasive plants, fish, and invertebrates on native fish.

12 **ii. Restore sufficient acres to achieve 20,000 total acres of tidal open water**
13 **habitats in the Delta by 2020.** Restoration locations should achieve fall open water
14 conditions of 1) temperature below critical thresholds, and 2) salinity of 0.5 to 6 parts
15 per thousand to support rearing habitat for resident native fish. Achieving this
16 quantity of open water habitat requires a mix of physical habitat restoration and
17 providing appropriate flows.

18 **iii. Restore an additional 15,000 acres of tidal open water habitats in the Delta by**
19 **2040, if viable.**

20 **c. Protect and enhance grasslands, farmlands, and seasonal wetlands to improve**
21 **ecosystem functions today and allow for sustainable intertidal communities with**
22 **projected future sea levels.**

23 The Delta is home to bird populations of international importance, and to populations of
24 mammals and other land-based species that require conservation attention. These
25 animals rely upon grasslands, streamside forests, and farmlands, as well as marshlands,
26 to survive. Any effort to revitalize the Delta ecosystem must protect and enhance these
27 lands in order to increase populations of key bird and other terrestrial animal species.

28 Grasslands next to tidal habitats are especially important. They support desirable
29 species that need both water and land-based habitats. If connected in corridors, they can
30 also allow migration of species between marsh habitats.

31 Tidal habitats will also move as sea level rises. At current sea levels, certain areas of
32 land are within the elevation band that the tides can wash over (approximately -3 to +3
33 feet elevation, relative to sea level), making them eligible for tidal marsh restoration. As
34 sea level rises, new lands will fall within this elevation band and other areas will fall
35 below it.

36 These new areas will be just uphill from the existing tidal elevations, on what is currently
37 grassland and farmland. In order to allow this necessary movement of tidal marshes as
38 sea level rises, these lands need to be kept in a land use that will permit eventual
39 conversion into tidal marsh decades from now.

40 The CDEW Council, the Delta Protection Commission, and the Delta Conservancy (see
41 Strategy 7.1) should carry out the following:

42 **i. Develop a model land-use protection ordinance for protecting sea level rise**
43 **buffer lands by 2010.** The model ordinance will provide cities and counties located
44 around the Delta margins with language for protecting these lands. The specific

language should reflect that only land uses incompatible with future ecosystem landward shifts should be precluded; many current land uses, including most forms of agriculture, are generally compatible with this protection.

ii. Acquire land ownership, easements, purchase options, or management agreements in areas adjacent to the highest priority ecosystem restoration areas by 2020. Land uses compatible with long-term open space buffer protection can continue on these properties. Acquire land ownership, easements, purchase options, or management agreements in areas adjacent to lower priority restoration areas by 2040.

iii. Acquire land ownership, easements, purchase options, or management agreements on other grasslands, riparian forest lands, and farmlands of conservation importance by 2020. Land uses compatible with the needs of identified species can continue on these properties.

iv. Support wildlife-friendly agriculture practices on Delta farmlands that are of conservation important (see Strategy 2.2).

d. General principles applicable to all types of restoration

- Establish wetlands before restoring tidal action in order to reverse subsidence where feasible. Consider marketing carbon sequestration credits for these subsidence-reversal efforts to assist with offsetting restoration implementation costs.
- Initiate a comprehensive land and easement acquisition program to make suitable lands available for restoration. For lands targeted for later restoration, use either lease-back approaches or easements with purchase options that allow existing land uses to continue until restoration.
- Include large blocks of variable land to support restoration of diverse ecosystem complexes. Appropriate variability can only be found around the perimeter of the Delta. The deeply subsided interior Delta does not contain the same variability.

e. Selecting Restoration Areas and Establishing Restoration Priorities

In determining where the best restoration opportunities are, a suite of criteria should be applied:

Opportunity Criteria

- 1. Topography.** The elevation of land relative to the tides and rivers is the fundamental criterion for restoration. Tidal marsh must be within modern ranges of the tides. Accommodating future sea level rise must occur in those elevations immediately above current intertidal zones. Shallow open water occurs at elevations below low tide, with target depth dictating how far below low tide is appropriate. Floodplains, by nature, are above modern tide elevations and suitable elevations depend strongly on how high rivers can rise during large flow events.
- 2. Topographic variability and habitat complexity.** Variability in elevations, within the desired ranges, supports the ability to establish interconnected complexes of multiple habitat types.
- 3. Size and shape to support branching (dendritic) channel networks in tidal marshes.** Branching channel networks that are self-maintaining require a minimum

drainage area as well as restoration parcels that are not too “long and narrow” to allow branching to occur. Defining the minimum size is not possible for the Delta at this time because there are no historical examples or adequate maps available to assess the relationship between marsh size and channel network geometry. The Department of Fish and Game has recently begun investigations into historical accounts that may yield some insight.

4. Length of interfaces across habitat types and associated connectivity.

Restoration parcels that provide for lengthy interfaces between habitat types, including uplands to wetlands, floodplains to wetlands, and wetlands to open water can, *if connected*, provide a greater exchange of organisms, energy, nutrients, water, and other materials. That, in turn, promotes greater ecosystem functions.

5. Sea level rise accommodation. Delta Vision is using the sea level rise numbers put forward in September 2007 by the CALFED Independent Science Board Chair of 55 inches by 2100. Most of that rise may occur later this century, though there is considerable uncertainty. Restoration sites that can accommodate sea level rise, primarily by allowing a small uphill shift of natural habitats into slightly higher elevations, will provide greater long-term sustainability of ecosystem functions.

6. Known presence of target species and natural communities. Restoration efforts in the near term should focus on locations where the primary species and natural community targets already occur and have the greatest potential to provide benefits in the shortest time frame possible. As conditions improve throughout the system, restoration should proceed over greater geographic extents.

7. Corridors within complexes. In order to survive, organisms move within and between natural habitats on daily, spring-neap tidal, seasonal, and interannual time scales. Successful movement depends wholly upon availability of corridors for these migrations.

Constraints Criteria

1. Proximity to influence of export pumps. Export pumps exert major influences on water flow directions and velocities in the Delta. Because of export pumps, fish in all life stages as well as the nutrients that support them are subject to direct entrainment or, at a minimum, the inability to reach necessary habitats. Locating restoration as far from pumps as possible reduces the significance of this constraint.

2. Position relative to future possible water supply conveyance. Moving water through the Delta to the export pumps affects habitat suitability by changing flow direction and minimizing variability. Restoration should avoid sites close to possible future water conveyance intakes and channels.

3. Proximity to major wastewater inputs. Loadings of nutrients and contaminants from wastewater inputs can adversely affect species, natural communities, and natural habitats. Locating restoration as far from these influences as possible minimizes their effect and maximizes the success of the restoration areas.

4. Proximity to high mercury loadings. Though mercury is widespread in the natural environment, there are some known source areas of high loadings. Locating restoration areas away from these sources reduces the potential for generating and transporting methyl mercury.

- 1 **5. High land values based on existing use.** Restoration of tidal marsh and aquatic
2 habitat necessitates a permanent land use change. Land acquisition is always a
3 significant component of restoration costs. High-value real estate will reduce the
4 amount of restoration area that can be acquired with available funds. Priority should
5 be given to suitable lands owned or controlled by governments or non-profit
6 organizations.
- 7 **6. Number of parcels per restoration area.** Restoration inherently needs to occur in
8 relatively large landscape blocks of land that can utilize natural landforms rather than
9 artificial structures, such as new levees to protect adjacent properties. The more
10 parcels in a restoration area, the more complex and costly the acquisition, planning
11 and restoration process.
- 12 **7. Infrastructure: Roads, rail, pipelines, natural gas field, transmission lines.**
13 Infrastructure must be protected and accessible for maintenance and repair or
14 relocated entirely for restoration to proceed.
- 15 **8. Proximity to harmful invasive species.** One of the greatest perils to ecosystem
16 restoration is harmful invasive species. Invasive species can colonize new habitat
17 and out-compete desired species for food and resources. Invasive species can also
18 prey on targeted species near restoration areas, preventing successful use of the
19 new habitats. Locating restoration areas farthest from known invasive species
20 populations, minimizing the suitability of new habitats for invasives, and controlling
21 harmful invasive species around and within restoration areas is essential to
22 restoration success.
- 23 Table S6-1 shows how much land there is in the Delta and Suisun Marsh at various
24 elevations appropriate for habitat restoration (Criterion 1). Not all such land would
25 actually be used for restoration.

1
2
3
4

TABLE S6-1.
Total Area Available to Reach Ecosystem Targets, by Subregion, Delta and Suisun

Elevation Category	Restoration Location, Groupings Based on Landform Divisions													TOTALS
	1) Suisun Marsh	2) Suisun-Cache Corridor	3) Cache Slough	4) Prospect	5) Yolo Bypass	6) Netherlands	7) East Delta, North	8) Sutter Island	9) Mokelumne/Cosumnes	10) East Delta, South	11) South Delta	12) Southwest Delta	13) Dutch Slough	
Elevation Range (ft NAVD88) Used in Analysis														
Upland (area above SLRA to Legal Delta boundary)	12+	12+	12+								10.5+	11+		
Sea Level Rise Accommodation (0-5 ft > MHHW)	7 to 12	7 to 12	7 to 12								5.5 to 10.5	6 to 11		
Intertidal (MLLW - MHHW)	1 to 7		3 to 7								2 to 5.5	2 to 6		
Shallow Subtidal (0-3 ft < MLLW) ¹	-2 to 1		0 to 3								-1 to 2	-1 to 2		
Intermediate Subtidal (3-6 ft < MLLW) ¹	-5 to -2		-3 to 0								-4 to -1	-4 to -1		
Deep Subtidal (deeper than 6ft < MLLW) ¹	< -5		< -3								< -4	< -4		
Area Available to Reach Ecosystem Targets (acres, from USBR GIS analysis August 2008) ^{2,3}														TOTAL ACREAGE
Upland Area	19,705	TBD	31,619	53	29512	12017	4438	150	5425	1690	85255	3402	39	193,305
Sea Level Rise Accommodation Area	8,482	TBD	9,717	110	16,234	10,371	10,678	550	4,905	7,227	23,351	2,451	242	94,318
Tidal Portion	54,119	0	14,203	1,632	9,183	28,847	15,252	1,898	9,328	16,832	46,205	7,131	924	205,554
Total Area (Upland, SLR, Tidal)	82,307		55,537	1,793	54,928	51,235	30,368	2,599	19,658	25,749	154,811	12,984	1,206	493,175
Area Detail for Tidal Portion														TOTAL ACREAGE
Intertidal	42,802	0	9,491	1,553	5,454	14,503	6,906	440	4,066	5,531	16,694	2,594	241	110,275
Shallow Subtidal	10,826	0	2,704	59	593	13,391	2,782	585	3,718	4,471	13,592	1,775	342	54,838
Intermediate Subtidal	491	0	1,930	20	1,625	935	2,860	862	1,492	5,737	10,047	1,576	234	27,809
Deep Subtidal	0	0	78	0	1,511	18	2,704	11	52	1,093	5,872	1,186	107	12,632
Total Area, Tidal Portion Detail	54,119	0	14,203	1,632	9,183	28,847	15,252	1,898	9,328	16,832	46,205	7,131	924	205,554

Notes:

- 1 All subtidal areas exclude existing tidal waterways; restoration opportunity areas already exclude the "deep Delta" or deeply subsided islands
- 2 All results based on DWR 2007 LiDAR 2m grid except for southeastern side of South Delta and far northern end of Yolo Bypass derived from 10m USGS DEM
- 3 Based on current sea level heights

Strategy 3.2. Establish migratory corridors for fish, birds and other animals along selected Delta river channels.

Enhanced multi-purpose river corridors connected with restored upstream habitat will improve the survival rate of endangered migratory species and popular sport fish. They will also increase recreational opportunities in the Delta and allow more flexible management of upstream reservoirs. Such river corridors are managed to allow easier migration, and where possible are connected to adjacent habitats and have streamside vegetation. In addition, each of the Delta's three major migratory river systems – the Sacramento, San Joaquin, and Mokelumne – should have multiple migratory corridors to allow passage under a broad range of conditions.

Various factors now impair the migration and survival of salmon, steelhead, and sturgeon in the Delta. These barriers can be minimized by:

- Providing sufficient and timely flows to support adult and juvenile fish migrations,
- Resolving conflicts between water conveyance and migration patterns,
- Establishing multiple migratory corridors for each river system, and
- Restoring large areas of floodplain and intertidal habitat along those corridors
- Restoring riparian and other emergent vegetation habitats along each corridor in areas away from large restoration areas.

Recovery of these fish populations enhances sport fishing and other recreational opportunities along these corridors. In addition, expanded flood conveyance capacity on selected Delta river channels would allow more flexible operation of upstream reservoirs, potentially increasing water supply.

Implementation will require close coordination and consistency among many parties, including the Delta Conservancy, DFG, USFWS, NMFS, DWR, USBR, non-project water users, and other restoration entities.

For each major river system in the Delta there already exist preferred corridors based on established migratory patterns and the current and future availability of suitable habitat.

Vision Recommendations Met

3, 9

Performance Measures

Number of functional migratory corridors per river system (Sacramento, San Joaquin, Mokelumne/Cosumnes) (+)

Amount of river miles connected to adjacent floodplain, tidal marsh, and shallow open water habitats (+)

Distribution of large habitat complexes along estuarine gradients and with extensive internal connectivity (+)

Incidents of migratory passage delays, blockages, or mortalities due to physical barriers, low dissolved oxygen, high temperatures, or toxics (-)

Dissolved oxygen concentrations in anadromous fish migratory corridors at all times (+)

Percentage of adult salmon, steelhead, and sturgeon surviving migration through Delta (+)

Percentage of juvenile salmon, steelhead, and sturgeon surviving migration through Delta (+)

Miles of habitat maintained with suitable water temperatures, flows, and habitat conditions for spawning and rearing of anadromous species (+)

- **Sacramento River** corridors are: (1) Yolo Bypass – Cache Slough – lower Sacramento River, (2) upper Sacramento River – Steamboat, Sutter, Miner, and lower Cache sloughs – lower Sacramento River, and secondarily (3) Three Mile Slough
- **San Joaquin River** corridors are: (1) mainstem San Joaquin River, (2) Old River, and, secondarily, (3) Middle River
- **Mokelumne River** corridors are (1) North Fork Mokelumne River and (2) South Fork Mokelumne River

As above, flow targets recommended here are based on the best available information and are for interim use until relevant agencies can develop and adopt flow targets through a comprehensive and transparent process. Decision makers must move to sufficient specificity regarding proposed actions to make informed decisions. These recommendations are based on available analyses and can be refined by additional scientific review concurrent with public policy processes.

In addition to these major river systems, improvements to Marsh Creek and Putah Creek might benefit steelhead populations.

The actions needed to carry out this strategy are:

3.2.1. Improve physical habitats along selected corridors by 2015.

These habitat improvements should be made with the needs of both fish and migratory wildlife in mind. Subject to further analysis in the CDEW Plan, this should involve:

- a. Implementing Yolo Bypass floodplain habitat improvements, without reducing flood safety (see Strategy 3.1)
- b. Expanding floodplains along the Mokelumne River, upstream of the Delta
- c. Restoring floodplains and tidal marshes at the Delta confluence – including integration with flood protection improvements in the McCormack-Williamson and New Hope Tract area
- d. Restoring floodplain habitats along the San Joaquin River upstream of the Delta, and between Vernalis and Stockton, wherever possible
- e. Restoring intertidal marsh throughout the Cache Slough complex
- f. Integrating lower San Joaquin River floodplain restoration with South Delta tidal marsh restoration after any conflicts with conveyance are reduced
- g. Restoring Prospect Island and other selected islands and tracts
- h. Enhancing and restoring channel margin habitat along:
 - i. Key Sacramento River locations, including Sutter Slough, Steamboat Slough, Miner Slough, Cache Slough between Miner Slough and the Sacramento River, and the main stem of the Sacramento River, beginning upstream of Steamboat Slough then proceeding downstream
 - ii. Both forks of the Mokelumne River and along the San Joaquin River downstream of where it meets the Mokelumne
 - iii. San Joaquin River and Old River with priority applied to migratory paths consistent with conveyance and operations

1 iv. Middle River, if it is not dedicated to conveyance

2 v. Three Mile Slough, unless it is cut off by barriers

3 **3.2.2. Provide adequate flows at the right times to support fish migrations, and**
4 **reduce conflicts between conveyance and migration, by 2012.**

5 Subject to further analysis in the CDEW Plan, this should involve:

6 a. Inundating the Yolo Bypass at least once every two years at levels similar to current
7 inundation extents (see Strategy 3.4) and altering Sacramento River flows to meet water
8 quality and fish passage flow needs

9 b. Reducing adverse flow effects from through-Delta conveyance during migration periods
10 on the Mokelumne River and its tributaries, including potential use of temporary or
11 permanent gates and barriers.

12 c. Achieving net downstream flow at Jersey Point from February through June, and one or
13 two fall pulse flows at Vernalis, as described in Strategy 3.4. Evaluate the use of
14 temporary barriers at the head of Old River to direct migrating fish toward the best water
15 quality and least entrainment risk

16 d. Closing the Delta Cross Channel during migration periods, especially November through
17 January.

18 e. Coordinating Mokelumne River corridor improvements with any changes in through-
19 Delta conveyance and the location of an isolated facility

20 **3.2.3. Immediately use the Central Valley Flood Protection Plan to identify areas of**
21 **the San Joaquin River within and upstream of the Delta where flood**
22 **conveyance capacity can be expanded (see also strategy 5.2).**

23 Use existing bond funds to begin acquiring title or easement to floodplain lands immediately,
24 especially in areas where urbanization threats are high.

25 **3.2.4. Use the National Heritage Area planning effort (see Strategy 2.1), beginning**
26 **immediately, to identify ways to encourage recreational investment along**
27 **the key river corridors, consistent with the improvements described**
28 **above.**

Strategy 3.3. Promote viable, diverse populations of native and valued species by reducing risks of fish kills and harm from invasive species.

Numerous ecological stressors must be reduced to revitalize the Delta estuary. Throughout the Delta's watershed, harmful invasive species and fish kills from improperly designed diversions continue to play havoc with the ecosystem.

Invasive species prey on native species, and outcompete them for food. Fish are killed by both state and federal water pumps, and at other municipal and agricultural diversions within the Delta. The size of the diversions relative to the channel from which they are pumped, and the time of year when operations are at highest demand, affect the number of fish killed.

Contaminants are also a stressor on fish and wildlife populations. Actions for reducing contaminant loading in the Delta are described in Strategy 3.5.

The critical actions necessary to implement this strategy are:

3.3.1. Reduce fish kills in Delta pumps by instituting diversion management measures by 2009, implementing near-term conveyance improvements by 2015 (see Strategy 5.1), and relocating diversions (see Strategies 3.4 and 3.5).

As these conveyance and diversion improvements are carried out, the following criteria should be used to reduce fish kills:

- a. Consolidate diversions and properly size and screen diversions.
- b. Reduce water demand relative to capacity (see Strategies 4.1 and 4.2) to permit greater flexibility in operations away from times of ecological sensitivity.
- c. Carefully manage exports during times of

Vision Recommendations Met

1, 3, 9

Performance Measures

Number of new, uncontrolled harmful invasive species (-)

Percentage of 1995-2000 average abundance and distribution of invasive clams (*Corbula* and *Corbicula*) (-)

Percentage of 1990-2000 average abundance and distribution of Brazilian waterweed (*Egeria*) (-)

Abundance of warm water centrarcid fish species (such as large mouth bass) (-)

Proportion of population of resident and migratory species (as larvae, juveniles or adults) taken at exports particularly when abundances are low (-)

Quantity of primary and secondary production taken at exports (-)

Percentage of outmigrating juvenile salmonid population entrained at Delta diversions (-)

Delta smelt and longfin smelt entrained at Delta diversions (-)

Ducks sustained at peak wintering abundance in Delta and Suisun Marsh combined (+)

Shorebirds sustained at peak wintering abundance in Delta and Suisun Marsh combined (+)

Aleutian Canada goose population sustained during winter residence (+)

1 greatest sensitivity with resident and migratory fish distribution.

- 2 **d.** Relocate diversion points to areas less likely to kill fish and away from new fish
3 populations and habitat restoration projects.

4 **3.3.2. Control harmful invasive species at existing locations, and minimize or**
5 **preclude their colonization of new restoration areas to non-significant**
6 **levels, by 2012.**

7 Possible methods include:

- 8 **a.** Control existing populations by chemical treatment and mechanical removal, or by
9 alteration of the habitat to disfavor unwanted species without harming desired species.
- 10 **b.** Minimize the potential of new invasives — including quagga mussel, zebra mussel, and
11 northern pike — by restoring habitat they are less likely to disturb, such as floodplains,
12 and designing fish screens that still work in the presence of freshwater mussels.
- 13 **c.** Reduce the likelihood of new invasives through a combination of public education,
14 tougher regulation and stricter enforcement.
- 15 **d.** Experiment to reverse the spread of freshwater invasives, using an adaptive
16 management experiment to reduce Delta outflow in summer or fall of critically dry years.
- 17 **e.** Restore floodplains, elevated side channels, or other habitats that periodically dry out, in
18 order to limit the impact of invasive species on the seasonal use of such areas by
19 desirable species.

Strategy 3.4. Restore Delta flows and channels to support a healthy Delta estuary

Freshwater flow conditions in the Delta must change to revitalize the ecosystem and the species that live in it. Higher and more variable flows provide new habitat, trigger reproduction and migration, transport nutrients and organisms, and maintain and improve water quality.

Major changes in the Delta's channel geometry over past decades, has homogenized flow conditions across seasons and reduced the total water supplied to the ecosystem. Natural flows, which varied by season and annual rainfall, have been altered to serve the purposes of water users through out the Delta watershed and of exports. This has contributed to the spread of non-native organisms and the decline of native species.

Current standards directing flows are mainly contained in the State Water Resources Control Board's D-1641, issued in 1999 and revised in 2000. There are complex relationships among these flow standards. Included are flow and operational standards for fish and wildlife measured at eight locations. Salinity water quality standards are measured at five municipal and industrial use locations and eight locations for in-Delta agriculture. Two additional salinity standards focus on fish and wildlife in Suisun Marsh and the San Joaquin River. Among these standards is the requirement to maintain Delta outflows in February through June, as measured by the location of the two parts-per-thousand salinity threshold known as "X2." This standard receives attention from both scientists and policy makers as it historically has a strong correlation with the abundance and survival of numerous estuary-dependent organisms in the Bay-Delta ecosystem.

The flow and water quality standards of D-1641 are increasingly recognized as inadequate. In late 2008, for example, the State Water Resources Control Board initiated workshops to provide background information and updates on San Joaquin River flow objectives, as salmon are declining under current flow standards. Pelagic organisms, including the Delta smelt, are also declining; some fear extinction of that species.

Vision Recommendations Met

1, 3, 7

Performance Measures

February to June Delta outflow meeting target as percent of unimpaired runoff (+, with greater percent increase at lower flows and lesser percent increase at higher flows)

Net downstream flow on San Joaquin River at Jersey Point Feb 1 to Jun 30 (+)

Number of 7-14 day duration fall flow pulses on San Joaquin River Vernalis reaching adopted target between Sep. and Nov. each year (+)

Number of months between Aug and Nov with Delta outflow reaching targets in below normal, above normal, and wet years (+)

Percentage of achievement of the state and federal "doubling goal" for wild, fall run Chinook salmon (+)

1 Flow analyses from the Pelagic Organism Decline (POD) work team are being used in legal
2 cases, rule making and ecosystem planning. They have recently emphasized the
3 importance of fall flows for Delta smelt,¹ a perspective reflected in other research.²

4 For most species, higher flows affect survival and abundance in multiple ways. Higher flows
5 increase habitat area, increase food supply, and ease fish and nutrient movement within the
6 estuary. Increasing spring inflows and outflows in most years, in particular, will improve
7 floodplain and open water habitat in the Delta and also habitat upstream.

8 Delta outflows during fall months strongly affect habitat quality for estuary-dependent
9 species, like Delta smelt. Higher fall outflows should follow wet springs. Lower fall outflows
10 should follow dry springs. Under natural conditions, wet winters and springs produced later-
11 season storms and larger snowpack that provided relatively greater outflows in the following
12 summer and fall months. The converse is true for drier winters and springs. Native species
13 have adapted to these conditions.

14 Modern water supply management has partially disconnected summer and fall flows from
15 prior winter and spring conditions. Fall dam releases, to make room for winter flood storage,
16 have led to above-natural fall flows. These artificial flows provide important low-salinity
17 aquatic habitat. Restoring locations that in the fall would provide suitable low-salinity aquatic
18 habitat without the same high level of fall Delta outflow would be an alternate mechanism to
19 meet ecological needs.

20 In the late summer and fall of critically dry years – about one year in ten – flow requirements
21 that create more variable conditions should result in salinity intrusions to the Delta and
22 improved carryover storage in upstream reservoirs.

23 The San Joaquin River is now hydrologically disconnected from the western delta and San
24 Francisco Bay at most times. Reconnecting it will revitalize a number of ecological
25 processes:

- 27 • Improved larval survival of delta smelt by
29 ensuring that some smelt spawned in the
31 south delta reach their nursery grounds in
33 the west delta.
- 35 • Better migration of salmon smolts by
37 providing migratory cues and reducing
39 stressors along their migratory corridors,
- 41 • Improved spread of zooplankton to fish
43 nursery areas, increasing fish populations,
- 44 • Improved delta water quality.

As stated above, decision makers must move to sufficient specificity regarding proposed actions to make informed decisions. These recommendations are based on available analyses and can be refined by additional scientific review concurrent with public policy processes.

45 Reconnecting the San Joaquin River can only be achieved through flow management in
46 conjunction with the implementation of other actions including channel reconfiguration (see

1 . Baxter, Randall, Rich Breuer, Larry Brown, Mike Chotkowski, Marty Gingras, Bruce Herbold, Anke Mueller-Solger, Matt Nobriga, Ted Sommer, and Kelly Souza. 2008. Pelagic Organism Decline: Synthesis and Conceptual Models for 2007. IEP Report. Available at: http://science.calwater.ca.gov/pdf/workshops/POD/IEP_POD_2007_synthesis_report_031408.pdf

2 . Feyrer, F., M. Nobriga, and T. Sommer. 2007. Multi-decadal trends for three declining fish species: habitat patterns and mechanisms in the San Francisco Estuary, California, U.S.A. Canadian Journal of Fisheries and Aquatic Sciences 64:723-734.

1 Strategy 3.2), changes in land use (see Strategy 6.2), construction of natural habitats to
2 provide resting places for fish (see Strategy 3.1) and reductions in diversions from the south
3 delta (see Strategy 3.3).

4 Achieving the flow targets of this strategy can be achieved by combinations of:

- 5 • Releasing more water from storage to improve flow conditions,
- 6 • Altering conveyance of water exports to the export pumps or
- 7 • Reducing the amount of water diverted, from, the Delta ecosystem.

8 From an ecosystem perspective, flow targets are achieved far more effectively by reducing
9 water diversions through the use of alternate supplies, conservation, increased efficiency,
10 retiring marginal agricultural lands, recycling, desalination, conjunctive use of surface and
11 groundwater supplies, regulatory re-allocation, and market mechanisms.

12 The critical elements of this strategy include the recommendations below. Additional
13 scientific analyses will be required to support these recommendations and must be
14 completed as the policy making processes move forward. The flow volumes included here
15 suggest the magnitude of what may be required, based on available science, and must be
16 refined during formal regulation writing.

17 **3.4.1. Charge the Department of Fish and Game to complete recommendations for** 18 **in-stream flows for high priority rivers and streams in the Delta watershed** 19 **by 2012 and for all major rivers and streams by 2018.**

20 These recommendations are the foundation for action by the State Water Resources Control
21 Board. DFG must be provided additional funds to complete these analyses and highest
22 priority must be given to analyses in the Delta watershed. A report to the legislature³ and
23 correspondence to the State Water Resources Control Board⁴ provide rationale for
24 additional funding and personnel, but offer differing priority lists of streams or watercourses.

25 DFG also signed a settlement agreement regarding in stream flow recommendations on
26 May 30, 2008.⁵ The settlement commits DFG to specified communications to the SWRCB
27 regarding its analyses and public reports on progress. Efforts to seek additional funds for in-
28 stream flow analyses are required. However, the settlement's requirements for actually
29 completing in stream flow recommendations fall far short of what is required. The settlement
30 requires "To the extent funds are available, the Department will begin one flow study in
31 2008. The Department will transmit to the State Board at least one flow recommendation
32 within the four year term of this agreement, subject to available funds, starting in 2010, the
33 Department will complete and transmit to the State Board, one flow recommendation per
34 year on average." (pages 7-8)

³ . Supplemental Report of the 2007-08 Budget Act, Department of Fish and Game, January 10, 2008.

⁴ . Letter from Carl Wilcox, Chief, Water Branch, DFG, to Vicky Whitney, Deputy Director, Division Water Rights, SWRCB, August 12, 2008.

⁵ . *California Coastkeeper Alliance v. McCamman*, (Superr. Ct. Sacramento County, 2007, No. 07-CS-01353, Notice of Final Settlement and Dismissal, May 30, 2008.

3.4.2. Develop and adopt management policies supporting increased diversion during wet periods, a joint effort of the State Water Resources Control Board, the Department of Fish and Game and the Department of Water Resources, and related federal agencies, to be completed by 2012.

Available science suggests the policies should include the following, in each instance needing more detailed guidance and also effective governance and management structures for addressing situations not anticipated in operations procedures:

- a. Avoid immediate high flow diversions. Fish use change in flows (or associated turbidity) to initiate movement.
- b. Allow flows upstream of the Delta during early-season high flow events. Fish benefit greatly from these early-season flows.
- c. Operate diversions during daylight hours to the extent possible. Fish migrate mostly at night.
- d. Provide higher flows than necessary to meet current regulatory requirements, at least at critical times, as these larger flows provide significant ecological benefits.

3.4.3. Adopt new State Water Resources Control Board requirements by 2012 to increase spring Delta outflow with implementation to commence no later than 2015.

The Board should revise the Bay-Delta Water Quality Control Plan to include new spring Delta outflow objectives by 2012.

Under the new requirements, the largest percentage flow increases will occur in dry and “average” years, while wet years generally will require no increase. These variable percentage increases allow greater water supply diversions during wet winter and spring periods. Even shifting diversions to wet periods, it is important to remember that the magnitude and duration of very high flow events are important ecologically. In the past, these flows were not captured or diverted due to limited storage and conveyance capacity. Improved storage and conveyance capacity offer increased opportunity for reliable water supply while improving ecosystem function.

3.4.4. Adopt new State Water Resources Control Board requirements by 2012 to reintroduce fall outflow variability no later than 2015.

Prior to 2000, there was more habitat for smelt and striped bass after wetter springs. After 2000, fall habitat quantity and quality has been consistently at levels previously only seen during drought years. This decline in fall habitat is an important predictor of reproductive success of delta smelt and, in some years, seems to have exacerbated the impact of other stressors on the Delta. Inflows to the Delta are largely unchanged over the last 30 years, but the export of upstream releases has greatly increased to the point where flows no longer support large areas of estuary habitat.

For the short term, the State Water Resources Control Board should revise the Bay-Delta Water Quality Control Plan to require fall outflows to provide habitat equivalent to the pre-2000 period. Appropriate fall flow standards should be set by the SWRCB. Among proposed recommendations from some scientists are that in the fall following a below-normal, above-

1 normal, and wet year, the requirements should provide two months, between August and
2 November, in which Delta outflows are between 1.5 to three times those during the 1990s.

3 **3.4.5. Revise the State Water Resources Control Board's Vernalis flow objectives**
4 **and the export criteria for the Central Valley Project and the State Water**
5 **Project by 2012 for implementation in 2015 to increase San Joaquin River**
6 **flows between February and June.**

7 **3.4.6. Provide short-duration San Joaquin River pulse flows in the fall starting in**
8 **2015.**

9 These pulse flows serve to provide migration cues to fall-run salmon and help improve south
10 Delta water quality. Scientists conclude that pulse flows are needed between September
11 and November. The Department of Fish and Game should provide advice to the SWRCB
12 upon which to establish appropriate pulse flows. As examples, some scientists recommend
13 that one or two pulse flows should last seven to 14 days and be in the range of 2,000 to
14 3,000 cubic feet per second volume measured at Vernalis.

15 **3.4.7. Reconfigure Delta waterway geometry to increase variability in estuarine**
16 **circulation patterns, by 2015.**

17 These reconfigurations should be planned in conjunction with near-term and long-term
18 conveyance modifications. These reconfigurations will include installing removable or
19 operable flow barriers, especially in channels of the south Delta, so that channel lengths are
20 greater than tidal excursion distances (see Figure 8). These modifications should allow for
21 continued navigation.

22 Reconfiguring portions of Delta channel geometry is to restore variability to transport,
23 improving ecosystem function. Humans have constructed numerous "connecting" waterways
24 throughout the Delta for shipping and water supply conveyance. Connecting what were
25 naturally disconnected waterways has radically altered flow geometry and homogenized the
26 aquatic environment, adversely affecting fish, their food resources, and water quality. Native
27 species evolved under natural heterogeneous water conditions – a likely cause of their
28 decline is the modern homogeneity of the Delta's remaining aquatic environments.

Strategy 3.5. Improve water quality to meet drinking water, agriculture, and ecosystem long-term goals

Managing water quality is critical to creating a reliable water supply and restoring the Delta ecosystem.

Contaminants such as agricultural pesticides and nutrient loads, municipal wastewater discharges and chemicals such as methyl mercury can contribute to the death of fish and the organisms they feed on. This strategy uses a combination of source control, which benefits many downstream uses, and relocation of intakes to improve water quality and reduce the amount of harmful pollutants in the Delta.

The Central Valley Regional Water Quality Control Board has assembled water quality information on the numerous rivers, streams, and drains that flow into the Delta. Many have had historical contamination problems. Virtually all have current contamination problems which threaten the Delta. The main pollutant contributors are old mining operations (mercury and other heavy metals), agriculture (pesticides, herbicides, nutrients, urban and stormwater discharges (pathogens), wastewater treatment plant discharges (ammonia, pathogens) unknown sources (toxicity), or a combination of causes (dissolved oxygen).

The CVRWQCB has taken more than 7,000 enforcement actions since 1990 to address these contamination sources. Virtually all of these actions involve rivers and streams directly feeding into the Delta.

However, in spite of this enforcement history, pollution pressures continue. Many rural, low-income areas are impacted, raising potential environmental justice concerns. At the same time, if the costs of making the needed improvements falls on low-income residents and workers, this also represents an environmental justice concern. Working through these issues requires additional attention.

Given current levels of population growth and climate change, water quality will be further degraded in the Delta unless dramatic steps are taken. Water conservation, pollution prevention, stormwater infiltration, water re-use, wastewater treatment, and water recycling are all necessary to improve Delta water quality. The burden of dealing with pollutants must include treatment at the source.

Relocating intake facilities or modifying the movement of water to draw more of it from flowing Delta channels improves the quality of drinking water and agricultural export supplies – and reduces adverse ecosystem impacts. For example, relocating the current

Vision Recommendations Met

1, 3, 9

Performance Measures

Percentage of time that contaminants or their precursors meet, or are better than, water quality targets (+)

Pathogen concentrations at Delta drinking water intakes (-)

Net levels of salinity in major groundwater aquifers (-)

Number of nuisance growths of algae or aquatic plants in the Delta or water project facilities (-)

Concentrations of contaminants in urban runoff and agricultural drainage flowing into the Delta (-)

Central Valley Project and State Water Project south Delta intakes to the Sacramento River near Hood would reduce bromide in exported water to approximately 5 percent of current levels and would reduce the take of Delta smelt.

Changes to Delta conveyance systems and the effects of climate change will impact the reliability and water quality for those with intakes located within the Delta. Investing in additional alternative intakes for these users can provide further flexibility in helping change the pattern of diversions to times and locations least harmful to the environment.

3.5.1 Require the Central Valley Regional Water Quality Control Board to conduct three actions:

- a. Immediately re-evaluate wastewater treatment plant discharges into Delta waterways and upstream rivers and set discharge requirements at levels that are fully protective of human health and ecosystem needs. This process should involve formal consultation with the California Department of Public Health.
- b. Adopt by 2010 a long-term program to regulate discharges from irrigated agricultural lands
- c. Review by 2012 the impacts of urban runoff on Delta water quality and adopt a plan to reduce or eliminate those impacts.

3.5.2. Relocate as many Delta drinking water intakes as feasible to channels where water quality is higher, and that are away from sensitive habitats.

In the near term, the North Bay Aqueduct and the Contra Costa Water District intakes should be relocated, with state and federal south Delta intakes relocated upon completion of the current environmental planning processes. The cost of these actions should be borne by the beneficiaries.

3.5.3. Establish Total Maximum Daily Load programs by 2012 for upstream areas to reduce organic and inorganic mercury entering the Delta from tributary watersheds.

The mercury program for the Delta itself should continue and other maximum daily load programs should be developed to meet known and future needs.

3.5.4. Comprehensively monitor fish and wildlife health beginning in 2009.

As part of its governance authority, the CDEW Council should build on the recent work of the U.S. Environmental Protection Agency (USEPA), the CALFED Science Program and the State and Regional Water Boards to develop a comprehensive monitoring program for fish and wildlife health in the Delta. In particular, these programs should make a concerted effort to study the overall health effects of the mixture of contaminants that cumulatively impact Delta species, as opposed to examining contaminant-species relationship one at a time.

In addition, develop a plan for comprehensively gathering, evaluating, and reporting contaminants and toxicity data currently being collected by the Water Boards and other agencies and programs by 2010. Initiate development of an integrated regional water quality monitoring program for the Delta in 2009.

Goal 4. Promote water conservation, efficiency, and sustainable use.

Strategy 4.1. Reduce urban, residential, industrial, and agricultural water demand through improved water use efficiency and conservation.

Paramount to the success of this Strategic Plan is a major shift over the next half-century in water use expectations and behaviors of California's communities and farming economies. Water must be used more efficiently in communities and in producing the crops that feed the state, nation, and world.

Over the last decade, some regions of California have improved water use efficiency, but the state needs to do better. Many of California's communities have implemented more efficient water use technologies, leading to some reductions in per capita use, particularly in coastal cities. However, while some urban regions have improved, others have lagged.

Governor Schwarzenegger has already established a target of reducing California's per capita water use by 20 percent by 2020, and directed state agencies to develop aggressive conservation plans to achieve this target. Even if this target is achieved, current trends indicate that population growth will overtake these conservation gains by 2030. Water saving devices and better water management practices can have an immediate effect on today's demand, but including a conservation ethic in planning for future residents – whose demand has yet to occur – is just as important.

Many water districts around the state have made vigorous efforts to improve indoor water use efficiency in recent years. The success of these programs means that it is now outdoor landscape irrigation which has the greatest potential for conservation and efficiency improvements in the urban sector.

In agriculture, opportunities to improve water use efficiency exist, but increased efficiencies often do not result in water savings that can be applied to other purposes. For most farming operations within the Delta watershed, diversions are made from surface water or groundwater to provide for irrigation demands. Water not used by crops generally returns to groundwater or surface water – though it is commonly of degraded quality. Throughout California, more closely matching applied water volume with crop requirements can result in real water savings. Over the past decade, increased delivery costs and less reliable water supplies have led to adoption of strategies for more efficient water use, but more can still be done.

Vision Recommendations Met

1, 4, 6

Performance Measures

Water use per capita, relative to 2008 baseline, by hydrologic region (-)

Water use per unit industrial economic output, relative to 2008 baseline, by hydrologic region (-)

Water use per unit agricultural economic output, relative to 2008 baseline, by hydrologic region (-)

1 Along with establishing conservation goals, planning how conserved water will be used must
2 play a critical role in state water management. The California Water Plan currently uses
3 scenario planning and analysis to understand the implications of water policy, but more
4 rigorous analysis is needed. The Water Plan Update 2005 projects that total agricultural
5 water use will decrease in the future under all scenarios as a result of reduced irrigated
6 acreage and crop shifts⁶, and planning now underway assumes that growing populations will
7 be able to use the excess supply. Current evidence suggests that total agricultural use is not
8 decreasing, however, and policies being developed for agriculture assume continued or
9 increased supplies of water. These policies are not sustainable given the expected
10 population growth and ecosystem needs.

11 The state must plan the future of water use in California with the public trust – including the
12 Delta ecosystem – in mind. Over the long-term, water prices for all uses will move closer
13 together. The large price differentials between urban and agricultural uses will be socially
14 and politically difficult to maintain. Water exchanges will tend to equalize prices, and
15 definitions of reasonable use can be expected to require ever more efficient use.

16 The three critical elements of this strategy include improving overall water use efficiency and
17 conservation statewide, reducing urban per-capita water demand, and ensuring the most
18 efficient use of water for irrigation:

19 **4.1.1 Improve statewide water use efficiency and conservation.**

- 20 **a. Enact legislation to require urban and agricultural water agencies to adopt more**
21 **aggressive tiered pricing and related mechanisms.**
- 22 **b. Reward entities that have successfully completed urban and agricultural water**
23 **management plans through state grants and loans from the Department of Water**
24 **Resources or the State Water Resources Control Board.**
- 25 **c. Continue the Department of Water Resources' support for the California Urban**
26 **Water Conservation Council and the Agricultural Water Management Council.**
27 These organizations provide leadership in water use efficiency and are preferable to
28 regulatory action.
- 29 **d. Encourage the use of basin water planning for both surface and groundwater.**
- 30 **e. Request the Department of Water Resources and the State Water Resources**
31 **Control Board to sharply increase public educational messaging and promote**
32 **widespread adoption of aggressive water conservation throughout the state**
33 **through market measures.**
- 34 **f. Request the Department of Water Resources and the State Water Resources**
35 **Control Board to consider a mandatory water "loading order" that would require**
36 **conservation and efficiency improvements before other supply augmentation**
37 **investments are undertaken.**

⁶ Groves, Matyac, and Hawkins. 2005. "Quantified Scenarios of 2030 California Water Demand." Prepared for the California Water Plan Update 2005.

4.1.2 Reduce urban per-capita water demand through specific recommended actions.

- a. **Enact legislation as requested by the governor requiring urban water purveyors to implement measures to achieve a 20 percent reduction in urban per capita water use throughout California by December 31, 2020.** Direct DWR to develop additional regional targets for 2050 that further reduce per capita water use as necessary to offset population growth. The baseline for the reduction targets will be the most recent reporting available to the Department of Water Resources as of November 2008.
- b. **Ensure new developments incorporate all available water use efficiency opportunities.** Establish requirements for land use authorities to undertake community-based water conservation and efficiency planning in cooperation with local water purveyors. These requirements should focus particularly on outdoor landscape irrigation, where there is the largest potential for efficiency gains in the urban sector.

4.1.3 Ensure the most efficient use of water in agriculture.

- a. **Require Agricultural Water Management Plans (AWMPs) be prepared and submitted to DWR ever five years starting in 2011.** Require these plans from (1) agricultural water districts using more than 3,000 acre-feet of groundwater and/or surface water and (2) counties who provide the regulatory oversight for individual agricultural groundwater users outside of recognized water districts⁷. The AWMPs should address projected agricultural water demands, availability of supplies, and implementation of Efficient Water Management Practices (EWMPs). The DWR's criteria would embody the analysis currently required by members of the Agricultural Water Management Council (AWMC). EWMPs, developed by DWR and the AWMC, should be treated as the floor-level of conservation, and updated every 5 years.
- b. **Strongly urge the SWRCB to use its authority to determine reasonable use of water over the coming decades to evolve the generally accepted practices of diverting surface water for irrigated agriculture.** Inform these on-going determinations with appropriate factual information associated with climatologic and agronomic factors.
- c. **Request the SWRCB and its regional entities to set goals to effectively manage return flows to surface water and groundwater systems.** Incentivize the adoption of irrigation management equipment and techniques and best management practices to comply with the Irrigated Lands Regulatory Program.

⁷ Agricultural water users not within the boundaries of a designated water supplier (e.g. irrigation district, water company, flood control and water conservation district, etc.) represent approximately 4 million acres of the approximately 9.6 million irrigated acres in the State. Many of these users pump groundwater and could be encouraged to implement efficiency measures through programs directed, managed and reported on by the local county to DWR.

Strategy 4.2: Increase reliability through diverse regional water supply portfolios.

Throughout the state, the general concept of regional self-sufficiency is being embraced through Integrated Regional Water Management planning. On their own or with the incentive of grant funding, many water management entities are banding together to optimize available water supplies, develop new local supplies, and manage demands in a more comprehensive manner. These collaborative planning efforts ensure regions are adequately addressing risks and investing in strategies to cope with an unpredictable future.

Elevating flexibility – a critical part of regional self-sufficiency – requires a diversified portfolio of water management strategies. Those include: New places, either above ground or below, to store supplies locally during periods of surplus; new facilities to reclaim or desalt otherwise non-potable or poor quality supplies; more appropriate land uses that control water demands, capture urban storm water, and result in less impact to water quality; and improved efficiency of existing and future agricultural and urban uses of water.

Greater regional water self-sufficiency allows Delta water diversions to reliably ebb and flow in unison with the water needs of the Delta ecosystem.

Success of the Strategic Plan requires more diversified regional water supply portfolios⁸. The critical elements include water recycling, desalination, stormwater infiltration, diversion data collection and reporting, and a regulatory framework that ensures integrated water resources management.

4.2.1. Modify the Water Recycling Act of 1991 to add a statewide target to recycle a total on the order of 1.5 million acre-feet of water annually by 2020.⁹

Ways to reach this goal include:

- a. Encouraging local and regional land-use and water management entities to require dual-plumbing when and where appropriate.
- b. Addressing issues associated with seasonal storage.

Vision Recommendations Met

1, 4, 6, 8

Performance Measures

Length of time, at average rates of use over a three-year period, that a given water district's alternative and stored supplies will last if there is a catastrophic outage of the Delta (+)

Amount of water in accessible surface and ground water storage compared to 2008 baseline (+)

Amount of water exported from the Delta that is recycled or re-infiltrated (excluding water lost to direct consumption by crops and people, or evapotranspiration) compared to 2008 baseline (+)

⁸ The concept of diversified regional water supply portfolios was extensively outlined in the California Water Plan Update: 2005. Integrated planning to address all potential supply and demand management strategies are strongly encouraged as a critical method to help.

⁹ The Water Reclamation Act of 1991 established a statewide goal to recycle a total of 700,000 acre-feet of water per year by 2000, and one million acre-feet of water by 2010. The California Water Plan Update 2005 stated California's water agencies currently recycle about 500,000 acre-feet of wastewater annually.

- c. Harmonizing State and regional permitting requirements.
- d. Modifying land use planning practices.
- e. Funding public educational efforts on the value of recycled water.
- f. Significantly increasing state funding for grant and loan programs.

4.2.2. Enact legislation now to encourage local water agencies to at least triple the current statewide capacity for generating new water supplies through ocean and brackish water desalination by 2020¹⁰.

California should continue to promote research of coastal and brackish water desalination projects that use renewable energy or participate in carbon offset programs.

4.2.3. Request that the State Water Resources Control Board set goals for infiltration and direct use of urban storm water runoff throughout the Delta watershed and its export areas by 2015.

Link achieving the goals with access to state grant and loan programs. Require local governments to include best management practices necessary to achieve the goals in both their land use planning and decision-making. The goals should also address of water quality degradation that could occur with urban stormwater recharge projects.

4.2.4. Request agencies to ensure that accurate and timely information is collected and reported on all surface water and groundwater diversions in California by 2012.

To accomplish this aim:

- a. Repeal all State Water Resources Control Board reporting exemptions for surface water diversions, and create new information systems to collect information on groundwater uses and report that data to the State Water Resources Control Board. Data should be collected by expanded Department of Water Resources' groundwater monitoring networks and reported by local and regional entities associated with Urban Water Management Plans and Groundwater Management Plans.
- b. Use state grants and loans as well as water transfer approvals from the Department of Water Resources or the State Water Resources Control Board to reward entities that are providing all necessary reporting data to the state.

4.2.5. Require, before 2015, that all water purveyors develop an integrated contingency plan in case of Delta water supply curtailments or drought.

Include a schedule of reductions from (a) drought conditions which reduce a purveyors' water supply by 40 percent for two years, and (b) a one-year loss of all surface water imports from the Delta. These plans, similar to one recently developed by the Metropolitan

¹⁰ According to the California Water Plan Update: 2005, there currently are about 24 desalting plants operating in California that provide water for municipal purposes. The total capacity of these plants is approximately 79,000 acre-feet per year. These include 16 groundwater, one surface water, and seven seawater desalination plants.

1 Water District of Southern California, should be developed with guidance from the
2 Department of Water Resources and incorporated into UWMPs submitted for 2015.

3 **4.2.6. Create a regulatory framework that encourages efficient and integrated**
4 **management of water resources at local, regional, and statewide levels,**
5 **with a focus on specific actions:**

- 6 **a.** Enact legislation to facilitate and encourage groundwater banking, extraction, and
7 delivery facilities, and protect groundwater recharge areas. Measures should address
8 immediate revisions of State and federal place-of-use restrictions, adoption of statewide
9 guidelines addressing injection permitting, and continuation of successful Department of
10 Water Resources and State Water Resources Control Board grant and loan programs.
11 Require land use plans to protect groundwater recharge areas.
- 12 **b.** Request local governments enact standards and provide incentive programs for low-
13 water use landscaping. Examples include “cash for grass” programs that pay
14 homeowners to reduce landscape watering like those introduced in Santa Ana, Marin
15 County, and other localities.
- 16 **c.** Request that the Department of Water Resources and the State Water Resources
17 Control Board form an inter-agency team to facilitate transfers between existing buyers
18 and sellers. These policies must not reduce or abrogate the constitutional provision that
19 all waters are the interest of the people of California and should be used to promote the
20 public welfare. Concepts to be promoted include rotational fallowing as a mechanism to
21 assure reinvestments of transfer funds into local agricultural economies, and pre-
22 approval of some transfers to create an “option” pool in case of emergencies.
- 23 **d.** Permit agencies to test new market mechanisms to provide water users and ecosystem
24 managers with better tools to cooperatively and adaptively manage instream flows and
25 diversions.

Goal 5. Build facilities to improve the existing Delta water conveyance system and expand statewide water storage, and operate both to achieve the co-equal goal.

Strategy 5.1. Expand options for water conveyance, storage and improved reservoir operations.

Achieving the co-equal goals requires a strategy that expands conveyance and storage options statewide and implements facilities that move water through and around the Delta.

In order to improve water supply reliability, the Task Force proposes a dual conveyance facility with an optimal combination of through-Delta and isolated facility improvements. It is a strategy that recognizes the need to maintain flows through the Delta for water supply and ecosystem health, while also accounting for future risks to statewide water supply, such as earthquakes or floods.

New conveyance is not enough. Storage must be increased and smarter operation of existing reservoirs implemented, to improve reliability for water users and reduce risk to the environment.

Issues of water reliability and sustainability must be considered in the context of future changes in the Delta from climate change and, potentially, seismic disruptions. Climate change will alter the amount and timing of snowmelt, leading to changes in storage and surface water flows. It will also cause sea level to rise. The potential for seismic events affecting the Delta will increase.¹¹ While none of these events are certain, not considering the possibilities in Delta planning would be foolish.

Any new water conveyance must allow flexibility in the timing and quantities of diversions to shift away from periods with highest impacts on Delta and upstream ecology while still providing predictable and acceptable volumes of quality water for diverted uses.

Our Vision called for dual conveyance of water supplies through and around the Delta as the “preferred direction”; however, the Task Force has concluded that much more analysis of sizing combinations, impacts, and costs of both an improved through-Delta component and an isolated component are needed to confirm any decision regarding dual conveyance and to finalize a design that contributes to our vision of co-equal goals for sustainable Delta management. The Task Force’s work will be completed before studies confirm the feasibility of dual conveyance. Based on the information at hand, the Task Force believes dual conveyance is the best option to meet the co-equal goals of a restored Delta ecosystem and

Vision Recommendations Met

1, 7, 8

Performance Measures

Likelihood of a catastrophic interruption of Delta conveyance system (-)

Amount of water in accessible surface and ground water storage compared to 2008 baseline (+)

¹¹ DWR. 2007. Delta Risk Management Strategy Draft Phase 1 Report.

1 reliable water delivery system. However, the Task Force's work will be completed before
2 studies confirm the feasibility of dual conveyance.

3 This Strategic Plan proposes:

- 4 • Investigation of a dual conveyance facility to meet the reliability goals for those
5 dependent on Delta water.
- 6 • Design and construction of new facilities for storage and conveyance – and changes in
7 operation of existing facilities – to improve water supply reliability statewide.

8 The detailed elements of this strategy are:

9 **5.1.1. Direct the Department of Water Resources and other allied agencies to**
10 **further investigate the feasibility of a dual conveyance facility, building**
11 **upon the Bay Delta Conservation Plan effort.**

12 Address specific elements to gauge the feasibility and design of the Task Force's conditional
13 dual conveyance recommendation. These include:

- 14 **a.** Directly assess alternative choices and design configurations by how well they serve the
15 co-equal goals
- 16 **b.** Analyze a full range of through-Delta flows and isolated facility flows on in-Delta
17 ecological processes and functions. Quantify thresholds for water required in the Delta
18 (in volume, timing, and quality at various locations) for effective functioning of the
19 estuarine ecosystem under different conditions.
- 20 **c.** Incorporate anticipated levels of usage of available ground and surface storage,
21 including possible gains from changes in system operations.
- 22 **d.** State the expectations on water diversions and comprehensively describe the decision
23 processes and rules that would be used to determine allowable diversions under a range
24 of hydrologic and climatic conditions.
- 25 **e.** Analyze implications for migratory fish species and upstream rivers.
- 26 **f.** Incorporate realistic estimates of reliable water transfers.
- 27 **g.** Identify and evaluate improvements to through-Delta conveyance for resiliency and
28 recoverability in the event of catastrophic loss and incorporate effective improvements in
29 analyses.
- 30 **h.** Incorporate a sea level rise projection of at least 55 inches (by 2100) in facility designs.
- 31 **i.** Evaluated all alternative facilities against a common level of seismic and flood durability.
- 32 **j.** Incorporate water quality objectives in analyses and evaluate the implications of the
33 alternatives.
- 34 **k.** Obtain permits and ground-test a 2-barrier Middle River conveyance option through the
35 Delta as recommended in the Delta Vision Stakeholder Coordination Group report and
36 modified by the Bay Delta Conservation Plan.

1 **5.1.2. Direct the Department of Water Resources and other allied agencies to**
2 **decide the size and location of new storage and conveyance facilities by**
3 **the end of 2010. Develop a long-term action plan to guide design,**
4 **construction, and operation.**

5 Inform design decisions with completion of CALFED surface storage investigations, which
6 require the Legislature and the administration to ensure stable state and federal funding
7 through Fiscal Year 2010.

8 **5.1.3. Complete substantial development and construction of new surface and**
9 **groundwater storage and associated conveyance facilities by 2020, with**
10 **the goal of completing all planned facilities by 2030.**

11 Complete construction, negotiate ownership, and operate significant new state or federal
12 storage facilities – surface and in-ground – through open and public bidding processes.

13 Manage groundwater storage projects and associated conveyance facilities through regional
14 entities in compliance with local groundwater management planning requirements and
15 applicable ordinances. Strengthen efforts to complement surface diversion and delivery
16 systems with groundwater management to increase flexibility in transfers.

Strategy 5.2. Integrate Central Valley flood management with water supply planning

The entire Central Valley is directly or indirectly reliant on Delta water. Major multi-purpose reservoirs exist on many of the Delta's tributaries to store surface water supplies, control floods, generate hydroelectricity and provide recreation. The challenges of flood control and water supply reliability in the Delta are two sides of the same coin. Within a given reservoir, water supply storage and flood control are competing priorities at certain times of year – more of one means less of the other.

Present management practices focus on maintaining a given capacity in the reservoir at a given time of year. Improved forecasting allows reservoir managers to modernize flood control operations so that more water can be stored for supply without compromising flood safety. Expanding the flood conveyance capacity downstream of reservoirs also increases management flexibility by allowing more flood water to be released safely from the reservoir if necessary.

Increased infiltration of Delta precipitation has the triple benefit of reducing flood peaks, storing water for later use in groundwater aquifers, and potentially reducing the amount of water that has to be exported from the Delta at critical times. It can also improve the quality of water through the natural filtering capabilities of soils.

As noted in Strategy 3.1, the preservation and restoration of floodplains has important environmental benefits. This strategy should be carried out in coordination with Strategy 3.1, especially Action 3.1.1, to ensure that these environmental benefits are achieved. In addition, Strategy 2.3 recognizes that on-island floodwater storage may be a viable use of certain Delta islands. Flood management planning should consider this possibility.

Actions needed to accomplish this strategy are:

5.2.1. Change the operating rules of existing reservoirs to incorporate and reflect modern forecasting capabilities.

Modernize by 2012 the flood control operation diagrams for all major California reservoirs for which the U.S. Army Corps of Engineers has prescribed flood control regulations. This modernization should take into account existing technology advances, the hydrologic changes that have occurred since the diagrams were first created, and the hydrologic changes likely to occur because of climate change. It should also account for any planned increases in the flood capacity of downstream rivers. At a minimum, the operations criteria should be based on forecasts — not on existing reservoir storage. The Department of Water Resources and the Bureau of Reclamation should cooperate with the United States Army

Vision Recommendations Met

1, 8, 9

Performance Measures

Additional annual yield from major reservoirs compared to current flood operation requirements (+)

Additional flood conveyance capacity on major rivers leading into the Delta, compared to 2008 baseline (+)

Percentage of precipitation in the Delta watershed that is infiltrated or directly used compared to 2008 baseline (+)

1 Corps of Engineers on both the update of the operations criteria, manuals and any
2 environmental impact studies required to accomplish the operational changes.

3 **5.2.2. Require the Department of Water Resources to immediately create a flood**
4 **bypass along the lower San Joaquin River.**

5 Use existing bond funds to quickly acquire title or easement to floodplain and bypass lands,
6 especially in areas where urbanization threats are high. Identify appropriate sites
7 immediately and protect them by easement or purchase.

8 **5.2.3. Request that the Department of Water Resources encourage greater**
9 **infiltration as part of watershed management planning.**

10 Specifically, request that the Department of Water Resources immediately incentivize
11 additional infiltration and storage of runoff and floodwater upstream of the Delta using both
12 groundwater and floodplain storage in the Sacramento Valley, San Joaquin Valley the
13 Tulare Basin, and any opportune sites in the upper watersheds. Work with the U.S. Forest
14 Service to revise its management plans for the National Forests in the Sierra Nevada to
15 encourage greater infiltration. Concurrently, request that the Department of Water
16 Resources study, and if feasible implement by 2012, a plan to convey water from storage
17 reservoirs to groundwater infiltration sites with an eye to expanding the storage and flood
18 control capacities of reservoirs.

Goal 6. Reduce risks to people, property, and state interests in the Delta by effective emergency preparedness, appropriate land uses and strategic levee investments.

Strategy 6.1. Achieve levels of emergency protection consistent with federal and state policies

Our Vision recognized that the Delta faces extraordinary risks in both the near term and the long term. Earthquakes, river floods, “sunny-day” levee failures, and continuing subsidence and sea level rise all pose substantial risks to people, property, and infrastructure in the Delta. Emergency response capabilities must be thoroughly assessed and rapidly strengthened.

In addition, the most cost-effective strategies for the protection of critical infrastructure systems — including highways — must also be assessed and quickly implemented immediately. Service providers themselves are in the best position to conduct assessment of the long-term risk exposure facing these systems. Highways should be considered separately, since they are directly managed by the state and are essential to any emergency response efforts in the Delta. These analyses must consider the full range of economic and life safety consequences of service outages, the likelihood of such outages, and the proportionate share of the collective costs and benefits achievable under co-location strategies. The analyses must consider these costs and benefits over a time period commensurate with the expected lifespan of the infrastructure system in question, not any shorter planning horizon used in financial or regulatory processes.

These actions achieve emergency protection and preparedness commensurate with the risks the Delta faces:

Vision Recommendations Met

9, 12

Performance Measures

Mileage of designated state highways secured against catastrophic failure by adequate levee improvement, elevation, or other means (+)

Number of people who have received Delta Emergency Response Training (+)

6.1.1. Complete a Delta-wide regional emergency response plan by 2010 that establishes legally binding regional coordination.

The plan must establish mechanisms for evacuation, animal control, and levee flood fighting, where needed. The plan must incorporate existing organizations and identify where regional coordination or management of common emergency functions would enhance overall response.

- a. This collaboration must include the state and local Offices of Emergency Services, the Delta Protection Commission, the Department of Water Resources, the Delta counties’ Flood Response Group, the U.S. Army Corps of Engineers, the U.S. Department of Defense, the U.S. Coast Guard and the Delta’s utilities, railroads, reclamation districts and water purveyors both public and private.

- 1 **b.** The entities with emergency responsibilities in the Delta should conduct periodic
2 exercises together to determine where any regional coordination gaps exist following
3 completion of the regional plan. These exercises should be supplemented by periodic
4 scenario simulations that help in identifying gaps in response capabilities.
- 5 **c.** The Delta Protection Commission should partner with the emergency response agencies
6 to identify gaps within existing plans and response processes.
- 7 **d.** The plan must establish automatic mechanisms to request mutual aid and protocols for
8 communication among all responders.

9 **6.1.2. Immediately begin a comprehensive series of emergency management and**
10 **preparation actions, beginning immediately.**

11 Include the Department of Water Resources, the Governor's Office of Emergency Services,
12 the Delta counties' Flood Response Group, the U.S. Army Corps of Engineers, the
13 Department of Defense and the U.S. Coast Guard. The actions, which should be undertaken
14 include:

- 15 **a.** Establish unified command and multi-agency coordination systems to improve overall
16 response.
- 17 **b.** Conduct an emergency disaster planning exercise in the Delta, involving all federal,
18 state and local agencies, to test multi-agency coordination processes.
- 19 **c.** Establish clear criteria for issuing mandatory evacuation orders. Also, establish a clear
20 process for issuing public advisories on levee conditions.
- 21 **d.** Implement the Inland Region Mass Evacuation Plan — already developed, but not
22 approved by the state — and harmonize local evacuation plans with its procedures.
- 23 **e.** Continue to conduct emergency response exercises and drills with citizens as well as
24 emergency response personnel.
- 25 **f.** Stockpile supplies, including caches for citizen emergency response, flood fights and
26 levee failure prevention, at strategic locations in the Delta.
- 27 **g.** Earmark flood control bond money for emergencies. Make sure it can be easily
28 accessed by the State Flood Operations Center or a local government to ensure that
29 whatever agency is closest and best qualified to cope with a developing threat to levee
30 integrity has the resources to stabilize the situation. All government agencies capable of
31 managing flood fights must be able to stabilize a levee without time-consuming
32 bureaucratic processes.
- 33 **h.** Sign contracts for barges along the entire West Coast to move people and supplies. In a
34 major disaster, California will need help from other states. Any existing mutual aid
35 agreements should be assessed and improved as needed;
- 36 **i.** Ensure that during a disaster there are enough persons available and sufficiently mobile
37 to repair breaches.
- 38 **j.** Create a Boat Search and Rescue Marshal Program for rapid evacuation of
39 neighborhoods;

- 1 **k.** Change building codes to require exits to a building's roof from the inside in deep
2 floodplains where the 100-year flood elevation for the area exceeds the height of the first
3 floor;
- 4 **l.** Paint lampposts on every block behind levees to show the 100-year flood or sea level;
5 and
- 6 **m.** Conduct additional school programs about emergency training.

7 **6.1.3. Complete a comprehensive analysis of the costs and benefits of highway**
8 **protection strategies, and adopt a policy based on its findings by 2012.**

9 The California Department of Transportation should conduct a comparative analysis,
10 beginning immediately, of the costs and benefits of:

- 11 **a.** Reinforcing levees to protect highways against seismic and other levee failure threats;
- 12 **b.** Armoring or raising individual highways or segments;
- 13 **c.** Fortifying highway corridors and adjacent infrastructure; and
- 14 **d.** Relocating highways to areas with lower flood risks both now and in the future when the
15 sea level is expected to rise.

16 **6.1.4. Complete a comprehensive analysis of the costs and benefits of**
17 **infrastructure protection strategies. Adopt a policy based on its findings**
18 **by 2012.**

19 A consortium of public utilities and other infrastructure service providers, convened by the
20 California Public Utilities Commission and the California Energy Commission, should begin
21 immediately to examine the collective long-term costs and benefits of:

- 22 **a.** Reinforcing levees to protect infrastructure against seismic and other levee failure
23 threats;
- 24 **b.** Locating infrastructure in fortified corridors;
- 25 **c.** Relocating infrastructure to areas with lower flood risks both now and in the future when
26 the sea level is expected to rise.
- 27 **d.** Tunneling infrastructure systems below the Delta.

Strategy 6.2. Discourage inappropriate land uses in the Delta region

Our Vision strongly declared that it is irresponsible to continue permitting new development in deep floodplains within the Delta. Deep floodplains are sites in the floodplains of rivers (or below sea level) that are at least several feet below flood stage. Levee failures in such places result in deep inundation of people and property and can be catastrophic. Locations below sea level are especially risky as water will remain until levees are repaired and water pumped out.

Land use decisions in the Delta are a matter of public safety. Even if new developments in flood-prone areas were to build their own levees, there would still be a considerable residual risk of flooding. Just as importantly, any new levees constructed to protect new developments in floodplains could actually increase failure risks for existing levees nearby. These risks will likely increase as climate change alters the flow patterns of the major rivers entering the Delta.

Despite the existence of the Delta Protection Act, and the Delta Protection Commission, development has continued to expand in the Delta, potentially threatening state interests and heightening safety risks in the region. Substantial population increases in the region are projected for the coming decades, increasing urbanization pressures in both the secondary zone – and the primary zone.

Besides increasing flood risks, urban development outside of the primary zone can also foreclose critical future ecosystem revitalization and climate change adaptation opportunities. Active floodplains are critical ecosystem revitalization sites, and should not be cut off by levees protecting new development. Lands just above current tidal elevation are critical long-range sea level rise accommodation sites, and should be conserved for that reason (see Strategy 3.1).

The Delta Protection Commission should continue be the primary region-wide land use governance entity, albeit with increased authority. In its new role the commission should:

- a. Exercise direct permit authority over development proposals in the primary zone as opposed to its existing appellate authority over the region;
- b. Oversee strengthening of land use oversight in selected portions of the secondary zone (see below) where public safety and state interests are at risk.
- c. Ensure that all its plans and regulations are consistent with the policy and plans of the California Delta Ecosystem and Water (CDEW) Council (see Strategy 7.1).
- d. Ensure consistency of local government plans and decisions for the secondary zone with the state interests articulated in the California Delta Ecosystem and Water Plan (see Strategy 7.2).

Vision Recommendations Met

2, 10, 11, 12

Performance Measures

Number of people living in legal Delta in areas with less than 200-year flood protection (-)

Number of structures in deep floodplains (more than 10 feet below sea level or river flood stage) that are not protected by 200-year levees (-)

Number of people living and working in deep floodplains (more than 10 feet below sea level or river flood stage) that are not protected by 200-year levees (-)

The key actions to carry out this strategy include:

6.2.1 Immediately strengthen land use oversight of the Cosumnes/Mokelumne floodway, and the San Joaquin/South Delta lowlands.

Although outside the primary zone, both are critical to achieving the co-equal goals of the Vision. Local governments should adopt plans for these areas compatible with this Strategic Plan. Those plans should be submitted to the CDEW Council for certification, or to the Delta Protection Commission if the Council has not yet been established. Pending certification, the Delta Protection Commission has jurisdiction over these areas in the secondary zone, just as it currently has in the primary zone. Upon plan certification, authority shall lie with the local governments.

- a. The **Cosumnes River/Mokelumne River** confluence is defined as the region generally east of I-5 running from the southern border of New Hope Tract and to the northern border of Glanville Tract to the eastern boundary of the legal Delta. State oversight should protect and enhance river corridors and riparian vegetation, foster flood-tolerant land uses, improve floodplain management, restore the ecosystem and improve water quality.
- b. The **San Joaquin River/South Delta Floodplain** is the region extending north from the southern boundary of the legal Delta, including all of Pescadero Tract, Paradise Cut, and Stewart Tract and Reclamation Districts R-2075, R-2084, R-2085, R-2094, R-2095, the portion of R-1077 generally north of Bethany Road, and the portion of R-2058 north of I-205. State oversight should enhance flood safety, create a natural floodway for the San Joaquin River to accommodate restored river flows, climate change, and sea-level rise, improve floodplain management, protect and enhance river and slough corridors and riparian vegetation, restore fish habitat and facilitate fish passage, promote additional flood tolerant land uses, increase water quality, better manage diversions and improve recreation, boating and waterway access.

6.2.2. Immediately strengthen land use oversight for Bethel Island, the city of Isleton and Brannan-Andrus Island.

Although located outside of the primary zone, safety risks from flood and sea level rise have persisted for decades and can be expected to worsen. Enact legislation by 2010, to require the respective local governments to adopt special plans that focus on risk reduction not only through emergency response, but through land use changes, including flood proofing, levee upgrade, and relocation. The local plan should bring land uses into conformity with the the CDEW Plan. These plans shall be prepared within three years and be submitted for certification to the Delta Protection Commission or to the CDEW Council upon its establishment.

- a. **Isleton/Brannan-Andrus Island** is all of Brannan-Andrus Island not currently in the primary zone. Oversight should: protect life and property under current conditions as well as under sea level rise, improve emergency services and access, under current conditions and multi-island failure conditions, strengthen response to levee failures, enhance seismic safety, assess the cost and benefit of different levee upgrade options and examine the implications of a Brannan- Andrus levee failure on other islands, Delta hydrodynamics, and salinity intrusion

1 **b. Bethel Island** oversight should protect life and property under current conditions as well
2 as under sea level rise, improve emergency services and access, under current
3 conditions and multi-island failure conditions, strengthen response to levee failures,
4 enhance seismic safety, assess the cost and benefit of different levee upgrade options
5 and examine the implications of a Bethel Island levee failure on other islands, Delta
6 hydrodynamics, and salinity intrusion

7 **6.2.3. Immediately prepare local plans for these five at-risk locations within the**
8 **primary zone: Walnut Grove, including the residential area on Grand**
9 **Island, Locke, Clarksburg, Courtland, and Terminous.**

10 These areas were developed prior to the Delta Protection Act and remain at high risk
11 without clear strategies for risk reduction and sustainability. The plans must:

- 12 **a.** Identify ways to reduce risk to life and property through land use policies, or a
13 combination of land use regulations and levee upgrades, including options for full-island
14 upgrades, island partitions, or ring levees. Recognize that current PL84-99 type levees
15 are not sufficient.
- 16 **b.** Consider the towns' historic internal needs, the towns' historic growth rates and their
17 architectural and cultural character.
- 18 **c.** Be reviewed and potentially incorporated in the new California Delta Ecosystem and
19 Water Plan.
- 20 **d.** Include a rationale for the state's participation in levee upgrades.
- 21 **e.** Plans may include common planning issues such as economic development, historic
22 preservation, public services, and infrastructure.

23 **6.2.4. Immediately form a landowner consortium to create a new land use strategy**
24 **that fosters recreation, increases habitat, reverses subsidence,**
25 **sequesters carbon, improves handling of dredged material and continues**
26 **appropriate agriculture on Sherman, Twitchell, and Jersey Islands.**

1 **Strategy 6.3. Prepare a comprehensive long-term levee investment**
2 **strategy that matches the level of protection provided by Delta levees**
3 **and the uses of land and water enabled by those levees.**

4 The Delta's 1,300 miles of levees are essential to the Delta now and critical to its future.

5 New policies and priorities are needed to provide long-term support of state interests in
6 ecosystem, as well as increase water quality and supply, navigation, and recreation.
7 Priorities for levee maintenance and upgrade should follow from the land uses and services
8 to be protected over the long run. Funding and financing of the levee system must become
9 more strategic, based upon specifically identified services and values that Delta levees
10 support.

11 Priorities must be established by a
12 comprehensive, geographically specific plan,
13 such as the CDEW Plan. State funding should be
14 directed primarily to levees that support state
15 interests — especially ecosystem vitality, water
16 quality and conveyance, and public use – and
17 that support the cultural, historical and aesthetic
18 value of the Delta as a place. Protection of some
19 Delta interests will be more dependent on
20 beneficiaries' ability and willingness to pay. Thus,
21 it is possible, perhaps even likely in the longer
22 term, that islands or tracts that are in low-value
23 private uses may convert to wetlands, open water, or flood-tolerant uses.

Vision Recommendations Met

9, 11, 12

Performance Measure

Index measuring compatibility between
levee designs and land uses (+)

24 The recommendations of this Strategic Plan embody the following findings and principles:

- 25 **1.** The current configuration of Delta islands and waterways is dependent on the existing
26 levee system. But some areas of the current levee system are not providing adequate
27 protection, and the existing landscape will not be sustainable over the long run if
28 anticipated changes from global warming and other risk factors occur.
- 29 **2.** Different levee design types and standards should be used to anticipate sea level rise,
30 river flooding, subsidence, and seismic risk, and provide levels of protection reflecting
31 the uses and services at risk.
- 32 **3.** A range of environmental enhancements should be applied to fit site conditions and
33 ecosystem goals.
- 34 **4.** Beneficiaries of levee protection should pay a share of the costs commensurate with the
35 benefits received.
- 36 **5.** Levee improvements and repairs should be based on economic feasibility and a
37 thorough evaluation of the services they provide.
- 38 **6.** In the event of a levee failure prior to the finalization of a new Delta-wide management
39 plan, any response should consider not just immediate repair and pump-out, but also
40 potentially *no action* or *breach-repair and rest*, depending on benefit/cost analysis and
41 consideration of the potential impact on the cultural and historical value of the Delta.
42 Major actions and upgrades should await completion of a comprehensive plan.

The actions recommended to carry out this strategy are:

6.3.1. Require the Department of Water Resources (DWR), in cooperation with local Reclamation Districts and other agencies, to develop a comprehensive plan for Delta levee investments.

The development of the plan must be overseen by the CDEW Council (see Strategy 7.1) and the levee plan must be consistent with the CDEW Plan (see Strategy 7.2). The other agencies involved must include the Delta Protection Commission, the Bay Conservation and Development Commission, the State Water Resources Control Board, the Department of Fish and Game, and the five Delta counties.

The levee plan must include full consideration of the levees' role in protecting people, land, reliable water supplies, water quality, aquatic ecosystems, infrastructure, the aesthetic and cultural values of the Delta, and the capacity for the Delta to evolve over the long term. It must consider threats to the levees posed by climate change, seismicity, subsidence, and localized deterioration. It must also consider the potential consequences of levee removal for remaining levees, including increased wind and wave fetch.

6.3.2. Appropriate \$750 million from Proposition 1E and 84 funds for the improvement of Delta levees.

Those funds should be dedicated to the improvements identified in the comprehensive plan, contingent upon the plan being completed by June 2010. Some portion of the funds, to be identified specifically in the plan, should be devoted to emergency levee repair and to the protection of Delta legacy towns.

6.3.3. Require those preparing the comprehensive levee plan to incorporate the Delta Levees Classification Table to ensure consistency between levee designs and the uses of land and water enabled by those levees.

In achieving consistency with the CDEW Plan, the levee plan must ensure that levee improvements do not induce new development to occur in floodplains, lands below sea level, or other locations at risk of flooding in the primary or secondary zones.

6.3.4. Continue the existing DWR levee subventions program until the comprehensive levee plan is completed.

In the interim period until the plan is completed, establish the Hazard Mitigation Plan (HMP) levee design as the minimum Delta levee standard.

6.3.5. Vest continuing authority for levee priorities and funding with the California Delta Ecosystem and Water (CDEW) Council (new entity described in Strategy 7.1) to ensure a cost-effective and sustainable relationship between levee investments and management of the Delta over the long term.

Goal #7: Establish a new governance structure with the authority, responsibility, accountability, science support and secure funding to achieve these goals.

Strategy 7.1. Create a new California Delta Ecosystem and Water Council as a policy making, planning and oversight body. Create a new Delta Conservancy to implement ecosystem restoration projects, and increase the powers of the existing Delta Protection Commission. Abolish the existing California Bay Delta Authority, transferring needed CALFED programs to the Council.

Attaining the co-equal goal is impossible without a new system of governance in the Delta. The new governance system must be capable of making difficult decisions and implementing effective policies.

The Task Force's November 2007 Vision document described the Delta as "a unique and valued area, warranting recognition and special legal status from the state of California." Despite the risks and inevitable changes that will confront the Delta in the coming decades, this Strategic Plan is premised on recognition of the Delta's unique natural, cultural and historic character, rather than abandonment of the region. Such recognition is warranted at a national as well as state level.

Vision Recommendations Met

10, 12

Performance Measures

To be determined.

When viewing the current governance structures in the Delta three key points emerge: state interests are neither clearly expressed nor effectively pursued, literally hundreds of federal, state and local governmental entities share responsibility for the Delta and its resources and no one entity is responsible for managing important state interests.

The Task Force's Vision called for a more effective governance structure that would "...ensure integrated action to implement this vision." In this Strategic Plan, the form of that governance is detailed.

The challenges of creating this new structure begin with a lack of unanimity over the proper goals to pursue and are compounded by climate change and sea level rise, as well as threats to the Delta and our water supply system from earthquakes, floods, levee failures and invasive species. But continuation of the current system of governance — a 'system' in name only — guarantees continued deadlock and inevitable litigation.

Accordingly, the Task Force proposes:

1. Creation of a California Delta Ecosystem and Water Council which will replace the existing California Bay-Delta Authority and subsume needed CALFED programs. The Council will:

- a. Adopt a California Delta Ecosystem and Water (CDEW) Plan to achieve the goals of our Vision and this Strategic Plan;
 - b. Ensure proposed actions by any state agency are consistent with the plan the new Delta Council creates. Use provisions of the Coastal Zone Management Act to address any inconsistencies by federal agencies;
 - c. Allocate funds to programs and projects consistent with its plan.
2. Creation of a California Delta Conservancy, to coordinate restoration of the Delta ecosystem, consistent with the Task Force's Vision, this Strategic Plan and the new management plan created by the Council.
 3. Expand the responsibilities of the existing Delta Protection Commission, and give it responsibility for managing the proposed National Heritage Area designation for the Delta.

Existing state agencies would retain their existing authorities but support development of the Council's plans and programs and exercise their authority in support of Council adopted policies and plans. The Department of Water Resources, California Department of Fish & Game, State Water Resources Control Board and other state agencies will exercise their authorities in the following areas, a critical part of the success of this recommended governance system:

- For the science and regulatory implementation of species protection laws: the California Department of Fish and Game and the United States Fish and Wildlife Service and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service.
- For linkage of ecosystem policies and programs focused on the Delta with the larger Delta watershed: the Department of Fish and Game, in cooperation with the United States Fish and Wildlife Service and the National Marine Fisheries Service, through the CALFED Ecosystem Restoration Program and the successor programs established by the Council.
- For construction and ownership of water conveyance and storage facilities: the California Department of Water Resources and the United States Bureau of Reclamation.
- For application of water rights and water quality laws: the State Water Resources Control Board and regional water quality boards.
- For land use and resource management policies under the Delta Protection Act: the Delta Protection Commission.
- For municipal functions, including police powers and contributions to the value of the Delta as a place: Existing local governments.

The following actions should be undertaken to create this structure:

7.1.1. Enact legislation to create a California Delta Ecosystem and Water Council to replace the Bay-Delta Authority and take over CALFED programs.

Council operations should begin at the earliest date possible. If a wholly new agency is required that date is January 2010. If the legislation enacting the Bay-Delta Authority can be modified to create the Council it could be created in summer 2009. Until creation of the

1 Council, roles recommended here would be the responsibility of the California Secretary for
2 Resources, unless otherwise provided.

3 The Council should have five to seven voting members, including a chair. Council members
4 should be appointed by the Governor and confirmed by the State Senate. No geographic,
5 occupational or representational criteria are proposed for these appointments.

6 Proposing criteria for appointment invites argument over categorization to be included in the
7 original legislation and then arguments over whether or not an individual fits the categories.
8 Instead, the criteria used for appointment of the Delta Vision Blue Ribbon Task Force in
9 Executive Order S-17-06 are appropriate: "...members...to include diverse expertise and
10 perspectives, policy and resource experts, strategic problem solvers, and individuals having
11 successfully resolved multi-interest conflicts."

12 Members should be entitled to serve for five-year staggered terms.

13 The Council should:

- 14 **a.** Develop and adopt a management CDEW Plan, incorporating the plans of other
15 agencies where appropriate to meet the charge to the Council The statute authorizing
16 the Plan should reiterate that other state agencies will still exercise their existing
17 authority to support the Plan.
- 18 **b.** Assume responsibility for any conservation or habitat management developed for the
19 Delta by the state or federal government.
- 20 **c.** Ensure federal and state consistency with the CDEW Plan.
- 21 **d.** Be designated a Trustee Agency pursuant to Public Resources Code Section 21000, et.
22 seq. and participate in CEQA processes on that basis
- 23 **e.** Determine the consistency of major water, road, railroad, utility and levee infrastructure
24 projects in the Delta with the Council's adopted Plan and communicate that
25 determination to the responsible agencies.
- 26 **f.** Assess policies applied outside the Delta which are critical to meeting Delta Vision goals
27 and convey the results of that assessment to the responsible agency.
- 28 **g.** Work with the Delta Science Program and the Delta Science and Engineering Board on
29 adopting sound principles of adaptive management.
- 30 **h.** Receive and allocate funds to advance policies and programs related to the Delta.
- 31 **i.** Include issues of environmental justice in the new CDEW Plan and in future Delta
32 decision-making.
- 33 **j.** Empanel a Public Advisory Group of stakeholders to advise, make formal
34 recommendations to the Council, and issue a public biennial report on their activities.
- 35 **k.** Adopt procedures for use of alternative approaches to dispute resolution, such as joint
36 fact finding and arbitration to reduce reliance on litigation and the courts.
- 37 **l.** Sue to ensure compliance with the new CDEW Plan.
- 38 **m.** Establish policies and procedures that ensure the day-to-day operation of water export
39 systems is consistent with the policies and plan adopted by the Council.

1 **7.1.2. Create a California Delta Conservancy as early as possible in the upcoming**
2 **legislative session.**

3 California has no entity responsible for implementing and coordinating Delta ecosystem
4 enhancement and related revitalization projects. California has a long and successful
5 history with conservancies, and there is widespread agreement that such an entity would
6 succeed in the Delta.

7 The California Delta Conservancy should:

- 8 **a.** Be devoted solely to the statutory Delta and the Suisun Marsh.
- 9 **b.** Be governed by a body with 11 voting members, including both local and state officials
10 serving staggered terms, with selected federal participation in non-voting roles. Five
11 members would represent the five Delta counties, selected by the Governor from
12 nominees advanced by the Delta Protection Commission; four members would be state
13 representatives, including the Secretary for Resources, the Director of the Department of
14 Finance, and two public members with business or land trust experience, appointed by
15 the Governor; and two public members, one each appointed by the President Pro Tem
16 of the California Senate and the Speaker of the California Assembly. The Governor
17 should appoint the chair of the Conservancy.

18 The California Delta Conservancy should be responsible for:

- 19 **c.** State ecosystem-related and urban waterfront projects in the Delta, Suisun Marsh, and
20 local plan areas. As the Suisun Marsh area is regulated by the Bay Conservation and
21 Development Commission, integration of the two authorities' plans and decision making
22 for this area should be given first priority.
- 23 **d.** Acquiring or placing under its management, such land as is needed to implement the
24 Council's final Plan. The conservancy should have the power to enter into contracts, to
25 buy and sell land and other property, and the power to acquire property through the
26 State Public Works Board. The Conservancy should be exempt from approval processes
27 of the Department of General Services.
- 28 **e.** Assuming responsibility, when offered, for lands currently in state, federal, or local
29 governmental ownership, or non-profit or private ownership.
- 30 **f.** Receiving funding from the State of California, the Council, or any other source, and
31 allocating those funds on its authority to purposes consistent with policies and plans
32 adopted by the Council.
- 33 **g.** Supporting appropriate recreation and ecosystem activities in the Delta, including
34 bolstering the local economy and National Heritage Area designation consistent with the
35 Council's Plan.
- 36 **h.** Creating incentives for mutually beneficial mixtures of traditional agriculture, habitat and
37 recreation, including agri-tourism, wildlife-friendly agriculture practices, bird watching,
38 and hunting.

39 **7.1.3. Strengthen through legislation the Delta Protection Commission.**

40 The DPC should be composed of representatives of all counties and cities in the legal Delta
41 to better assess and coordinate local land use planning and emergency response. Votes of

city representatives would be weighed commensurate with the city's population. Other members should include the Central Valley Flood Prevention Board and the United States Army Corps of Engineers (in a non-voting liaison capacity) to better assess and coordinate flood protection issues.

The Delta Protection Commission was created in 1992 and given appellate review of proposed land uses in the Delta primary zone. The Delta Protection Act and the actions of the commission have protected the primary zone effectively. Despite this past success, three factors support changes in the future:

- The state's interests in the primary zone, already large as evidenced by policies focused on water and the ecosystem, land ownership, and funds for levees, will continue to grow. Improved conveyance and ecosystem restoration projects anticipated in the next decades will both impact the primary zone. Additionally, the primary zone includes 880 miles of levees, a majority of levees in the Delta, and integrated approaches to their maintenance will be important.
- As reflected by the miles of levees in the primary zone, this is the area most at risk from sea level rise or seismic events.
- Land uses in the primary and secondary zones are becoming more critical to state interests regarding flood protection and ecosystem function.

To address these changed state interests, this strategic plan recommends expanding the responsibilities of the Delta Protection Commission in four regards.

- Within the primary zone, the Delta Protection Commission is given direct permitting authority. This is intended to integrate decision making in this critical area where land uses are already heavily limited by the Delta Protection Act by creating a single arena for addressing both state and local government interests in land uses in the primary zone.
- Harmonizing the commission's Land Use and Resource Management Plan with the California Delta Ecosystem and Water Plan as well as other relevant state legislation, such as the 2007 state floodplain development laws.
- Exercising appellate authority over local government plans as applied to the secondary zone, focused on the state's interests in the three areas of flood management, ecosystem function and water supply reliability.
- Carrying out oversight of interim planning responsibilities identified under strategies 6.2.1, 6.2.2, and 6.2.3.

7.1.4. Require the California Delta Ecosystem and Water Council to create a Delta Science and Engineering Program and a Delta Science and Engineering Board by September 1, 2009.

California must maintain a strong and consistent investment in science and engineering important to the Delta. There needs to be a more direct link between scientific investigation and real-world management and policy. To achieve this, the Council will need both a permanent Science and Engineering Program staff and an independent Science and Engineering Board that reviews Council actions.

The Delta Science and Engineering Board should consist of between 12 and 20 individuals with natural science, social science, engineering, and policy expertise appointed by the

Council to a maximum of two, five-year terms. Lead scientists appointed by the Council should have a rotating appointment of 3 years. To ensure independence, continue the current practice where lead scientists are formally engaged by an agency other than the state, such as the United States Geological Survey.

The Science and Engineering Program should be a replacement for, and a successor to, the successful CALFED Science Program and the Delta Science and Engineering Board is a replacement for the CALFED Independent Science Board. The Science and Engineering Program should have the following responsibilities and authorities:

- a. Research critical scientific issues of both the physical Delta and elsewhere in the state relevant to Delta management.
- b. Organize, assess and synthesize the best available science for policy makers and the Council.
- c. Review all major projects undertaken to advance the goals of Delta Vision.
- d. Conduct independent science and engineering reviews of the work of government agencies or consultant work upon the request of the Council., the Conservancy or other state agencies.
- e. Establish communication channels to effectively transmit science and engineering results to broader and more diverse audiences, coordinating with the Council's Public Advisory Group. Develop discussion papers and interactive lectures.

7.1.5. Improve the compliance of the diversions and use of water with all applicable laws.

Effective enforcement of existing laws and regulations regarding diversions and use of water is an important foundation for improved governance. In order to protect and enhance the co-equal values over time, the state must create an integrated policy system among state agencies with jurisdictional authority affecting the use of water from the Delta watershed. This system involves establishing clear roles and responsibilities for State agencies regarding the approval, monitoring and enforcement of water diversions, and the management of impacts of diversions to resources and values protected by the State. Adequate information is required for action and it is not now available.

The critical elements for improved information include:

- a. **Coordinate the authoritative oversight of the State Water Resources Control Board (SWRCB) and the Regional Water Quality Control Boards (RWQCB) to ensure compliance with the reasonable use doctrine** and applicable water quality requirements by water diverters within, and exporting from, the Delta watershed.

The SWRCB will require secure annual funding for additional positions to investigate water rights compliance, illegal diversions, waste and unreasonable use. The SWRCB's capacity should be expanded to be able to:

- i. Require monitoring by all water diverters, including those within the Delta who are currently not required to report diversions
- ii. Authorize monetary penalties for monitoring and reporting violations
- iii. Possess adequate penalties for unauthorized diversions and violations

1 iv. Possess provisions for interim relief

2 **b. The SWRCB should develop an integrated Supervisory Control and Data**
3 **Acquisition (SCADA) network** that covers all significant permitted and licensed surface
4 water diversions and permitted discharges to provide real-time information into a
5 database linked to water rights licenses. The SCADA would enable the state to flag and
6 achieve redress for any excess diversions beyond permit terms.

7 A striking fact about the current water system is that information about current diversions
8 and use is inadequate to the task of managing the co-equal values. More
9 comprehensive data from throughout the Delta watershed would provide a better
10 foundation for changes in water diversion timing and support efforts to become more
11 regionally self-sufficient. Therefore, California must develop and use comprehensive
12 information on the local, regional and statewide availability, quality, use and
13 management of groundwater and surface water resources to help improve opportunities
14 for regional self-sufficiency.

15 **c. Install stream gauging stations** at critical outflow points associated with the
16 Department of Water Resources (DWR) planning area boundaries to aid in the DWR
17 regional “water budgeting” used to help develop the California Water Plan.

18 **d. Require DWR to continue to regularly and systematically collect groundwater**
19 **elevation data** in all groundwater basins and sub-basins in the Delta Watershed, and
20 make the resulting information readily and widely available.

21 **e. Require DWR to expand its current network of monitoring wells**, including
22 groundwater elevation and groundwater quality monitoring wells, and continue to
23 coordinate data monitoring and interpretation with local entities.

Strategy 7.2: Create a California Delta Ecosystem and Water Plan to ensure flexibility and consistency among state, federal and local entities.

The California Delta Ecosystem and Water Plan is intended to guide and shape management of the Delta to ensure its revitalization and create a statewide reliable water delivery system.

The current lack of a legally binding, cohesive plan has caused agencies and Delta stakeholders to work in a vacuum, developing policies and programs that lack context. The CALFED Record of Decision included most elements of such a plan but failed to be implemented for three reasons: those in charge had no authority to ensure its implementation, those that were implementing it had no accountability and in the end, there was no money.

In addition, all parties recognize that the management of the Delta is rife with uncertainty. Any functional governance structure must be flexible and adaptable to changing circumstances. A governance structure built around a plan can achieve this flexibility by incorporating periodic revisions, and grounding management directions in adaptive management principles. Importantly, management and scientific understanding must evolve together. Management decisions and plan provisions must incorporate the best available science, but also must be formulated in such a way that the next generation of scientific knowledge can be generated through direct observation of the Delta’s response to various actions.

The key elements of the California Delta Ecosystem and Water Plan are:

Vision Recommendations Met

10, 12

Performance Measures

Length of time before negative trends in the performance of other indices are reversed (-)

Number of preemptive or corrective actions on agency decisions taken each year by the CDEW Council to ensure consistency with CDEW Plan (-)

Percentage of financial investments in Delta ecosystem enhancement that are not consistent with CDEW Plan (-)

Percentage of financial investments in water infrastructure and regional self-sufficiency programs that are not consistent with CDEW Plan (-)

Percentage of financial investments in Delta levees and highways that are not consistent with CDEW Plan (-)

Number of times that state funding for local investments is withheld due to non-compliance with CDEW Plan (-)

7.2.1. Develop a legally enforceable California Delta Ecosystem and Water (CDEW) Plan.

The CDEW Plan is intended to achieve the co-equal goal of Delta Vision. It will build upon, and integrate, other plans, modifying and extending them as needed to meet its responsibilities. Those other plans include, but are not limited to: the Ecosystem Restoration Program being developed by the Department of Fish and Game, the Land Use and Resource Management Plan developed by the Delta Protection Commission, any local Habitat Conservation Plan within the Delta, the Suisun Marsh plan under development,

1 sections of the California Water Plan that address reliable water supply being developed by
2 the Department of Water Resources, and the Conservation Program resulting from the
3 BDCP. Those responsible for implementing these other plans shall do so in a manner to
4 support achieving the adopted CDEW Plan.¹²

5 Existing policies and programs in the Delta lack cohesion and integration. The aim of this
6 proposed Plan is to remedy those two faults. The Plan should be developed and adopted in
7 less than five years. The Council should be authorized to adopt an interim Plan until
8 completion of the final plan.

9 Approving a Plan governing the Delta ensures consistency among existing state, federal
10 and local agencies and provides the flexibility needed to meet the Delta's management
11 challenges. Local governments and other state and federal agencies will continue planning,
12 decision-making and operations — consistent with the California Delta Ecosystem and
13 Water Plan.

14 The CDEW Plan must:

- 15 • Incorporate any species protection requirements that impact Delta resources.
- 16 • Incorporate requirements for water flow and water quality in the Delta that achieve the
17 co-equal goal.
- 18 • Define state land use interests in the Delta, especially those that impact the ecosystem,
19 water supply reliability and flood concerns. Work through the Delta Protection
20 Commission and local governments to protect those interests. In the case that these
21 state interests extend from the Delta into adjacent areas, work with relevant local
22 governments to address the linkages.
- 23 • Provide principles and procedures for adaptive management
- 24 • Provide for data collection, management, monitoring, analysis and interpretation to
25 support policy decision-making.
- 26 • Ensure flexibility and resiliency in managing the Delta.
- 27 • Incorporate the recommendations of this Strategic Plan.
- 28 • Articulate a detailed financing plan that identifies costs, benefits, and revenue sources.
- 29 • Serve as a foundational document for a programmatic Environmental Impact Statement
30 or Environmental Impact Report as well as any projects undertaken requiring California
31 Environmental Quality Act and/or National Environmental Policy Act permits.

32 The Task Force recommends the state Legislature and the Council carry out the following
33 actions to develop and adopt the Delta Ecosystem and Water Plan:

- 34 1. Adopt legislatively by May 2009, this Delta Vision Strategic Plan as the Interim Plan for
35 the Delta.
- 36 2. Develop by August 2009, through the new Council, a legal and procedural outline for
37 adopting the Plan.

¹² . Examples of how to achieve this result are found in Tahoe Regional Planning, among others.

- 1 **3.** Prepare a list of all applicable legal requirements in the Delta that must be incorporated
2 into the new Plan by August 2009. Included in this list will be federal and state
3 Endangered Species Acts management actions and plans.
- 4 **4.** Have the Council begin developing the new Delta Plan by September 2009 consistent
5 with the procedural and substantive requirements of the Coastal Zone Management Act.
6 Coordinate with stakeholders as well as state, federal and local agencies. Start by
7 assessing existing plans and planning efforts and use elements which are consistent
8 with the goals of Delta Vision. Strong participation of local, state and federal agencies
9 will help to better integrate their responsibilities and capacities into the Plan.
- 10 **5.** Seek the counsel of the Council's Public Advisory Group to enhance stakeholder
11 participation and actively address environmental justice concerns.
- 12 **6.** Try to have the Council adopt the new Plan by December 2010. If the complete Plan is
13 not ready, the Council should adopt an interim plan. Activities not covered in the interim
14 plan shall be guided by this Strategic Plan until the full Plan is adopted.
- 15 **7.** Identify by December 2010 any inconsistencies in the State Water Resources Control
16 Board's Water Quality Control Plans and the new Delta Plan and address any
17 inconsistencies.
- 18 **8.** Require the Council to review and if necessary, amend the Plan at least every five years.

19 **7.2.2. Institutionalize adaptive management through updates to the CDEW plan** 20 **every five years.**

21 The Delta is not only complex, but its future is uncertain. Recognizing both uncertainty in
22 knowledge and uncertainty about policy outcomes is important to shaping future Delta
23 management. That's one reason why adaptive management must be at the center of Delta
24 governance and decision-making.

25 Adaptive management is defined by the federal government as follows:

26 “A type of natural resource management in which decisions are made as part
27 of an ongoing science-based process. Adaptive management involves
28 testing, monitoring, and evaluating applied strategies, and incorporating new
29 knowledge into management approaches that are based on scientific findings
30 and the needs of society. Results are used to modify management policy,
31 strategies, and practices.”

32 Adaptive management is not a series of after-the-fact reactions to changes in ecosystem
33 performance. Adaptive management requires decision making which recognizes the
34 probability of less than desired results and makes decisions based on the best available
35 science and best available policy tools. Adaptive management equally commits to
36 observing, analyzing and understanding the results of those prior actions. Finally, adaptive
37 management requires the political, managerial and operational capacity to design and
38 implement improved actions.

39 This cycle is repeated, incorporating over time, changes in the underlying systems,
40 advances in scientific understanding, new policy tools, and changing policy decisions. To
41 gain the advantages of local knowledge and increased stakeholder commitment to not only
42 particular decisions, but also to the iterative character of adaptive management,
43 considerable attention must be given to effectively incorporating stakeholders over long

1 periods of time. As authority for making and/or implementing relevant policies is often
2 fragmented among several state, federal and local agencies, similar attention must be given
3 to effectively linking multiple agencies over long periods of time.

4 The recommended CDEW plan integrates the actions of many relevant agencies and is
5 regularly revised on five year cycles. These regular reviews and updates provide a schedule
6 of review activities in which to gain the value of stakeholder participation. This rhythm of
7 review cycles also requires organizing scientific understanding and program assessment to
8 inform policy making.

Strategy 7.3. Finance the activities called for in the California Delta Ecosystem and Water Plan from multiple sources.

Successful governance of the Delta depends on a coherent, effective and reliable financing structure.

That is anything but the case today. Existing funding is woefully short of accomplishing either part of the co-equal goal – let alone both.

New funding sources and strategies are needed to cover capital costs, make habitat improvements, buttress levees and improve the wheeling of water. This new system of financing must be premised on beneficiaries of improvements paying commensurate to their benefit.

Any financing system will require flexibility. The benefits, costs, obligations, and risks in the Delta have not been quantified nor can they be with certainty. However the price tag is in the tens of billions.

The range of estimated costs for alternative conveyance provided by the Department of Water Resources is \$4.2 billion for an eastern alignment to \$7.2 billion for a western alignment. The department estimates through-Delta improvements could cost from \$1.2 billion to \$9.6 billion depending on the seismic issues. The earlier Delta Risk Management Study analyses projected much larger costs: \$26 billion for alternative conveyance and \$32 billion for armored through-Delta conveyance.

A late 2007 summary of cost estimates of proposed Delta ecosystem revitalization projects undertaken totaled to \$2.5 billion. Levee improvements could cost as much \$20 billion, according to the risk management study.

These estimates suggest that capital expenditures required for the Delta in the next 10-15 years will range from \$12 billion to \$24 billion, with a high estimate of \$80 billion. The annual operating costs of the Council are unknown.

Bond funds are available for some of these capital investments and water contractors are prepared to pay the capital costs of alternative conveyance. But it is still a large price tag.

Given the size of the price tag – and the uncertainty over ultimate costs – it is all the more important to ensure commitments to transparency and cost effectiveness as well as to generating broader sources of revenues. New participants will be identified and new funding sources developed over time. We must also maximize the availability and use of federal funding, and ensure access to all current and future bond funding.

Vision Recommendations Met

9, 10, 12

Performance Measures

Finance tools deployed efficiently (+)

Projects and programs implemented with reliable finding (+)

Percentage of required Delta revenues collected in a timely manner (+)

Correspondence of expenditures by agencies and others with CDEW Plan (+)

1 **7.3.1. Enact a series of principles regarding design of financing into legislation**
2 **authorizing the Council:**

- 3 **a.** Employ as wide a range of financing instruments as possible. Multiple revenue streams
4 are always more effective than relying on a single source.
- 5 **b.** Assess beneficiaries of capital improvements a share of the costs and of the risks and
6 liabilities. The state of California should be responsible for activities of broader benefit.
- 7 **c.** Ensure consistency and smart prioritization of spending by having revenues allocated by
8 the Council. If any funds devoted to implementing the Plan are used by any state agency
9 for other purposes, no water shall be conveyed through the Delta for the State Water
10 Project until diverted funds are restored. This protects revenues against diversion in tight
11 budget years and also ensures that all elements of the plan advance together.
- 12 **d.** Create no expectation of public payment for any water required for ecosystem
13 revitalization.
- 14 **e.** Make access to state funding contingent on a project contractor or a water right holder
15 demonstrating full compliance with all aspects of California resources laws and policies,
16 including complying with the new Delta Plan, possessing a legal right to divert, store,
17 convey, and use water and satisfying all applicable water quality and ecosystem
18 regulations determined to protect the resources and values of the state.
- 19 **f.** Authorize terminating or reducing funding for any federal, state or local agency that
20 conducts activities inconsistent with the new Delta Plan or the policies of the Council.

21 **7.3.2. Establish a base of revenues outside the state General Fund for the work of**
22 **the Council, the Conservancy, the Delta Protection Commission and**
23 **related core activities of the Department of Fish and Game, the**
24 **Department of Water Resources and the State Water Resources Control**
25 **Board.**

26 Those revenue sources could include:

- 27 **a.** Levy a per-acre-foot fee on water diversions within the Delta watershed, and a separate
28 fee on any water conveyed through or around the Delta. These fees could be specific to
29 activities recommended here or be undertaken on a broader basis to provide core
30 funding for ecosystem and water resource policies state wide. In the latter approach, a
31 sufficiently large fraction of revenues should be dedicated to the activities recommended
32 here.
- 33 **b.** Protect revenues against diversion to other purposes in tight budget years and ensure
34 that all elements of the plan advance together by prohibiting use of funds for any
35 purpose other than activities approved in a CDEW Plan. If no other effective approach is
36 available, include a provision to halt conveyance of water through the Delta for the State
37 Water Project if revenues earmarked to implementing the Plan are diverted to another
38 purpose.
- 39 **c.** Require integrated action consistent with the Council's Plan in any Delta-related bond or
40 financing instrument. Similar provisions should be included in all contracts.

- d. Require local interests to develop a finance plan to pay for the local share of a capital project. Local cost shares should be linked to the benefits received and the cost of services provided. Require a completed finance plan as a precondition for the design and construction phases of a major capital projects.
- e. Impose the following conditions on any public and private beneficiaries of Council financing:
 - i. Affirm that all actions by the support the adopted Plan.
 - ii. Ensure full transparency in all fiscal arrangements.
 - iii. Comply with all existing policies and programs.
 - iv. Guarantee constancy through specific bond control language and contract provisions.
 - v. Use life-cycle costing and benefit-cost calculations.
 - vi. Require full allocation of costs and risks, in proportion to benefits received.
 - vii. Allow no subsidized use of California resources.
 - viii. Structure water rates to encourage conservation by greater use of variable rates, tiered rates and connection fees.
 - ix. Develop a comprehensive funding plan for capital projects anticipated over the next 30 years, including operation and maintenance costs and assess the beneficiaries of each project.
 - x. Link any bond and/or appropriation of state funds ecosystem revitalization success and improved water supply reliability.

7.3.3. Find new revenue sources beyond the traditional bond funds or public allocations.

Some possible sources include generating revenues through conservation, mitigation banking, sequestering carbon and reducing carbon emissions to pay for ecosystem restoration.

Mitigation and Conservation Banking.

Mitigation and conservation banking could provide important funds to help ecosystem restoration. A conservation bank generally protects threatened and endangered species habitat. Credits are established for the endangered or threatened species on the site. Conservation banks must be approved by the State and federal wildlife agencies. Mitigation banking is conservation banking except it applies specifically to wetland restoration, creation, and enhancement undertaken to compensate for unavoidable wetland losses.

Carbon Offsets.

Established carbon markets are readily available and are increasingly accepted by State and federal authorities. On the Chicago Climate Exchange, contracts representing tonnage of CO2 equivalent are traded. Converting farmed Delta islands with peat soils to natural wetlands could provide two types of offsets. The first comes from a reduction in subsidence. The Delta's peat subsides at a rate of one to three inches a year, mostly in the form of

1 carbon dioxide releases. Another offset would come from the additional CO2 sequestered
2 by cattails or Tules. The future carbon price is very uncertain but it appears that CO2 offsets
3 might repay a significant share of Delta island acquisition and wetland restoration costs.

4 **Private and voluntary contributions.**

5 Contributions from landowners can help pay for ecosystem projects. Landowners can
6 sometimes reduce their estate taxes by donations of fee simple or land easements.
7 Financing campaigns can also garner private voluntary contributions for both broad
8 purposes which also enhance visibility and support (e.g., a "Friends of the Delta" effort) or
9 specific projects ("help protect critical habitat for Aleutian Canadian geese").

10 Possible additional new sources of revenue include (a) charging more for water of higher
11 quality or reliability or (b) assessing the value of levee improvements to navigation and
12 recreation and charging appropriate fees for those uses.

1 **Delta Vision Acronyms and Abbreviations**

Agricultural Water Management Council	AWMC
Bay Delta Conservation Plan	BDCP
Bureau of Reclamation	Reclamation
California Delta Ecosystem and Water Council	CDEW Council
California Delta Ecosystem and Water Plan	CDEW Plan
California Department of Fish and Game	DFG
California Environmental Quality Act	CEQA
Central Valley Project	CVP
Central Valley Regional Water Quality Control Board	CVRWQCB
Coastal Management Plan	CMP
Coastal Zone Management Act	CZMA
Contra Costa Water District	CCWD
Delta Protection Commission	DPC
Delta Risk Management Strategy	DRMS
<i>Delta Vision: Our Vision for the California Delta</i>	Vision
Department of Fish and Game	DFG
Department of Water Resources	DWR
Ecosystem Restoration Program	ERP
Efficient Water Management Practices	EWMPs
Environmental Impact Report	EIR
Environmental Impact Statement	EIS
Environmental Water Account	EWA
Integrated Regional Water Management	IRWM
National Environmental Policy Act	NEPA
National Heritage Area	NHA
National Marine Fisheries Service	NMFS
National Ocean and Atmospheric Administration	NOAA
operations and maintenance	O&M
Pelagic Organism Decline	POD
Public Advisory Group	PAG
State Water Project	SWP
State Water Resources Control Board	SWRCB
Supervisory Control and Data Acquisition	SCADA
Total Maximum Daily Load	TMDL
U.S. Army Corps of Engineers	USACE
U.S. Department of Agriculture	USDA
U.S. Environmental Protection Agency	EPA
U.S. Fish and Wildlife Service	USFWS
urban water management plan	UWMP

Appendix Table 1. Indicators and Performance Measures

Table 1 lists the performance measures are proposed for each indicator. These indicators and their components will be tracked, along with the status of strategy implementation, and reported to policy makers and the public through a Delta Vision Report Card, which will be issued by an independent and objective board on a regular basis. The Report Card will provide essential feedback to the Council regarding Vision realization and individual strategy success. The Report Card will indicate if implemented strategies are working, or it may signal to policy makers that a course adjustment is necessary.

Note that Goal 1 is represented by a roll-up of all indicators and performance measures, so is not listed here. These are interim measures, to be refined by the Delta Science and Engineering Board and the CDEW Council before July 2009.

Goal	Indicator	Sub-indicators	Performance Measures
2	Delta Recognition and Value	Recognition and legal status	1. Application steps completed for special designations (+)
		Economic vitality	2. Gross regional product from recreation and tourism (+)
			3. Gross regional product from agriculture (+)
			4. Gross regional product from sustainable agriculture (+)
			5. Success rate of small and new Delta businesses (+)
		Public benefit	6. Acres of land providing public benefits of habitat, flood conveyance, subsidence reversal, or carbon sequestration (+)
3	Estuary Health	Habitat extent and function	1. Acres of restored tidal marsh, Delta (not accounting for sea level rise) (+)
			2. Acres of restored tidal marsh, Suisun (not accounting for sea level rise) (+)
			3. Acres of restored shallow open water habitat in the Delta (+)
			4. Acres of active floodplain (+)
			5. Acres of seasonal wetlands and grasslands (+)
			6. Acres of fall open water habitat between 0.5-6 parts per thousand salinity (+)
			7. Number and geographic distribution of large habitat complexes incorporating two or more interconnected habitat types (+)
			8. Number of functional migratory corridors per river system (Sacramento, San Joaquin, Mokelumne/Cosumnes) (+)
			9. Amount of river miles connected to adjacent floodplain, tidal marsh, and shallow open water habitats (+)
			10. Distribution of large habitat complexes along estuarine gradients and with extensive internal connectivity (+)
			11. Incidents of migratory passage delays, blockages, or mortalities due to physical barriers, low dissolved oxygen, high

Goal	Indicator	Sub-indicators	Performance Measures
			temperatures, or toxics (-)
			12. Dissolved oxygen concentrations in anadromous fish migratory corridors at all times (+) 13. Percentage of adult salmon, steelhead, and sturgeon surviving migration through Delta (+) 14. Percentage of juvenile salmon, steelhead, and sturgeon surviving migration through Delta (+) 15. Miles of habitat maintained with suitable water temperatures, flows, and habitat conditions for spawning and rearing of anadromous species (+)
		Native and migratory species populations	16. Percent of aquatic food web support by diatoms (+) 17. Number of new, uncontrolled harmful invasive species (-) 18. Percentage of 1995-2000 average abundance and distribution of invasive clams (Corbula and Corbicula) (-) 19. Percentage of 1990-2000 average abundance and distribution of Brazilian waterweed (Egeria) (-) 20. Abundance of warm water centrarcid fish species (such as large mouth bass) (-) 21. Proportion of population of resident and migratory species (as larvae, juveniles or adults) taken at exports particularly when abundances are low (-) 22. Quantity of primary and secondary production taken at exports (-) 23. Percentage of outmigrating juvenile salmonid population entrained at Delta diversions (-) 24. Percentage of achievement of the state and federal "doubling goal" for wild, fall run Chinook salmon (+) 25. Numbers of Delta and longfin smelt entrained at Delta diversions (-) 26. Ducks sustained at peak wintering abundance in Delta and Suisun Marsh combined (+) 27. Shorebirds sustained at peak wintering abundance in Delta and Suisun Marsh combined (+) 28. Aleutian Canada goose population sustained during winter residence (+)
4	Water Sustainability	Water use efficiency and demand	1. Water use per capita, relative to 2008 baseline, by hydrologic region (-) 2. Water use per unit industrial economic output, relative to 2008 baseline, by hydrologic region (-) 3. Water use per unit agricultural economic output, relative to 2008 baseline, by hydrologic region (-) 4. Amount of water exported from the Delta that is recycled or re-infiltrated (excluding water lost to direct consumption by crops and people, or evapotranspiration) compared to 2008 baseline (+)
		Water supply sustainability	5. Length of time, at average rates of use over a three-year period, that a given water district's alternative and stored supplies will last if there is a catastrophic outage of the Delta (+)

Goal	Indicator	Sub-indicators	Performance Measures
5	Water Supply Reliability	Water reliability for ecosystem and human uses	6. Amount of water in accessible surface and ground water storage compared to 2008 baseline (+)
			1. Likelihood of a catastrophic interruption of Delta conveyance system (-)
			2. February to June Delta outflow as percent of unimpaired runoff (+), with greater percent increase at lower flows and lesser percent increase at higher flows)
			3. Net downstream flow on San Joaquin River at Jersey Point Feb 1 to Jun 30 (+)
			4. Number of 7-14 day duration fall flow pulses on San Joaquin River at 2,000-3,000 cfs at Vernalis between Sep. and Nov. each year (+)
		Storage and conveyance capacity	5. Number of months between Aug and Nov with Delta outflow at 1.5 to 3 times 1990s conditions in below normal, above normal, and wet years (+)
			6. Amount of water in accessible surface and ground water storage compared to 2008 baseline (+)
			7. Additional annual yield from major reservoirs compared to current flood operation requirements (+)
			8. Additional flood conveyance capacity on major rivers leading into the Delta, compared to 2008 baseline (+)
			9. Percentage of precipitation in the Delta watershed that is infiltrated or directly used compared to 2008 baseline (+)
		Water quality	10. Percentage of time that contaminants or their precursors meet, or are better than, water quality targets (+)
			11. Pathogen concentrations at Delta drinking water intakes (-)
			12. Net levels of salinity in major groundwater aquifers (-)
			13. Number of nuisance growths of algae or aquatic plants in the Delta or water project facilities (-)
			14. Concentrations of contaminants in urban runoff and agricultural drainage flowing into the Delta (-)
			15. Salinity variability between fresh to brackish conditions during periods necessary to meet life history requirements of broad range of desirable aquatic species (+)
			16. Number of days per year water temperature exceeds life history requirements for broad range of desirable aquatic species (-)
			17. Number, duration, and areal extent of incidences during which dissolved oxygen levels drop below regulatory standards (-)
			18. Extent of areas listed as low dissolved oxygen impaired water bodies on RWQCB Section 303(d) list (-)
			19. Number, duration, and areal extent of incidences during which pH falls outside regulatory standards (-)
			20. Concentration of methyl mercury in Delta water and sentinel species compared to 2008 baseline and Water Quality Control Plan standards (-)
			21. Concentration of selenium in San Joaquin River, Delta waters and sentinel species compared to 2008 baseline and Water Quality Control Plan standards (-)

Goal	Indicator	Sub-indicators	Performance Measures
6	Delta Risk		22. Concentration of ammonia in Delta waters compared to 2008 baseline and Water Quality Control Plan standards (-)
			23. Number of new contaminants added to RWQCB Section 303(d) list (-)
		Levee design	1. Index measuring compatibility between levee designs and land uses (+)
		Appropriate land use	2. Number of people living in legal Delta in areas with less than 200-year flood protection (-)
			3. Number of structures in deep floodplains (more than 10 feet below sea level or river flood stage) that are not protected by 200-year levees (-)
			4. Number of people living and working in deep floodplains (more than 10 feet below sea level or river flood stage) that are not protected by 200-year levees (-)
7	Government Effectiveness	Emergency preparedness	5. Mileage of designated state highways secured against catastrophic failure by adequate levee improvement, elevation, or other means (+)
			6. Number of people who have received Delta Emergency Response Training (+)
		Performance	1. Length of time before negative trends in the performance of other indices are reversed (-)
			2. Number of preemptive or corrective actions on agency decisions taken each year by the CDEW Council to ensure consistency with CDEW Plan (-)
			3. Percentage of financial investments in Delta ecosystem enhancement that are not consistent with CDEW Plan (-)
			4. Percentage of financial investments in water infrastructure and regional self-sufficiency programs that are not consistent with CDEW Plan (-)
		Consistency	5. Percentage of financial investments in Delta levees and highways that are not consistent with CDEW Plan (-)
			6. Number of times that state funding for local investments is withheld due to non-compliance with CDEW Plan (-)
		Funding security	7. Finance tools deployed efficiently (+)
			8. Projects and programs implemented with reliable finding (+)
			9. Percentage of required Delta revenues collected in a timely manner (+)
			10. Correspondence of expenditures by agencies and others with CDEW Plan (+)

NETHERLANDS ROUTE

SACRAMENTO RIVER



ASK ANY AGENT FOR FOLDER
SOUTHERN PACIFIC

Figures 1.24. Promotional Material for The Netherlands route, 1911. *Source: California State Railroad Museum*



Figures 1.36a-1.36c. Produce labels from the Delta, 1910s-1930s. *Source: www.thelabelman.com/*

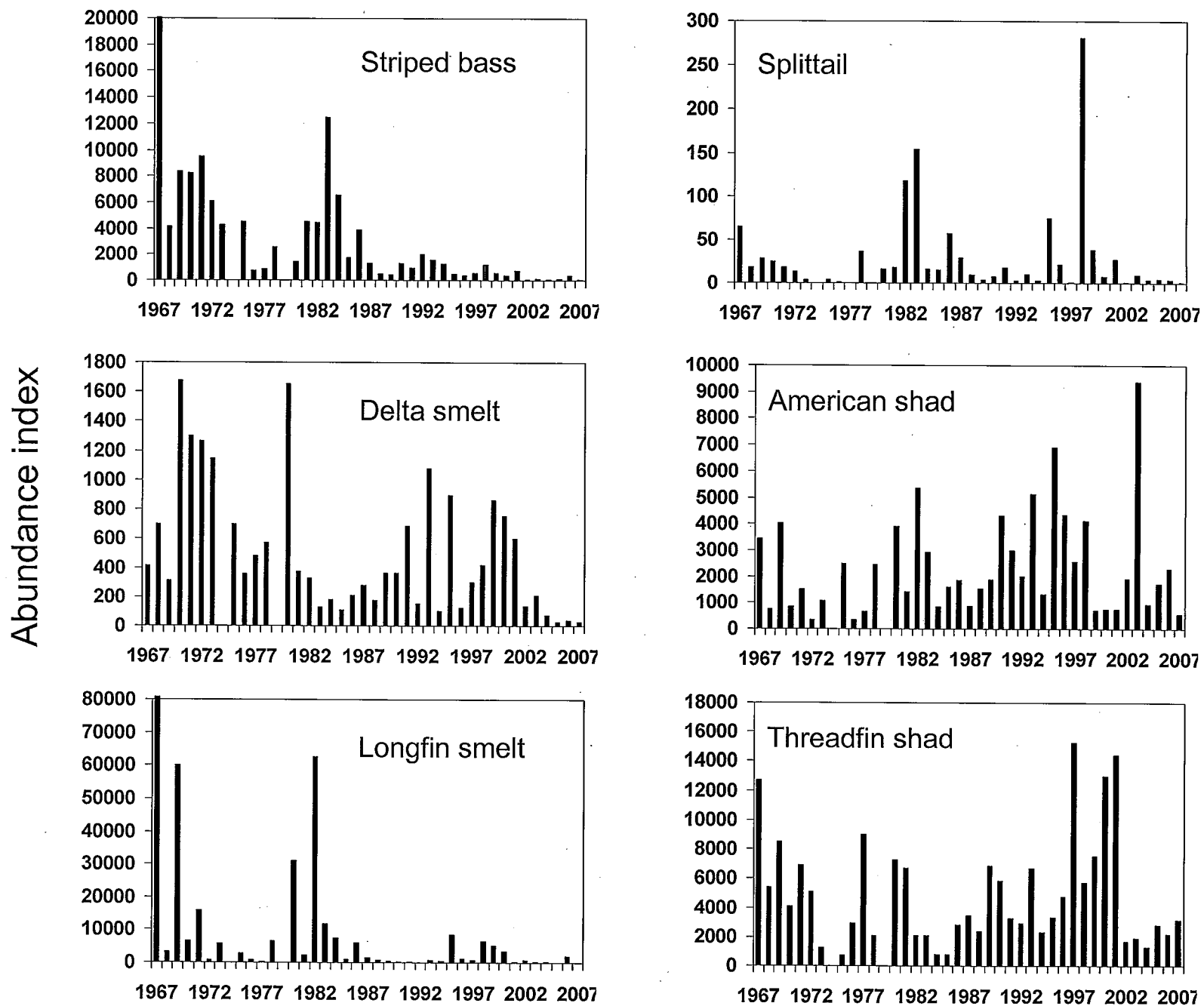


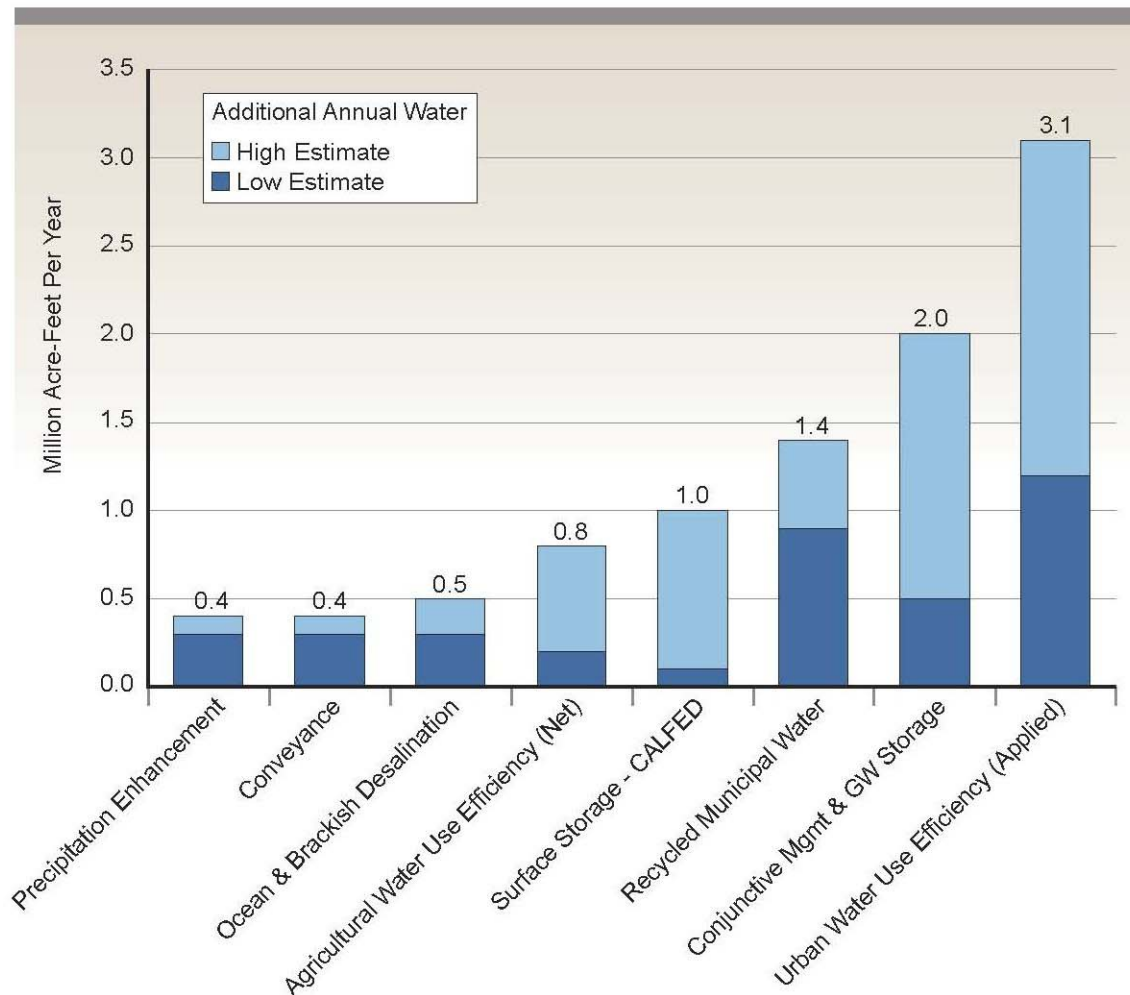
Figure 2-3: Abundance of Key Fish Species in Delta, 1967-2007



Juvenile salmon that grow up in a floodplain (right) grow faster and larger than those from the main channel (left).

Photo by Jeff Opperman; from Cosumnes River field study by Carson Jeffres.

Figure 2-5: Strategies to Reduce Water Demand or Increase Supplies



This graph shows the potential range of more water demand reduction and supply augmentation each year for eight resource management strategies. Low estimates are shown in the lower (dark blue) section of each bar. The water supply benefits of the resource management strategies are not additive. As presented here, urban water use efficiency includes reduction in both consumptive and nonconsumptive uses (or applied water), whereas agricultural water use efficiency only includes reduction in consumptive uses (or net water).

Source: California Department of Water Resources, California Water Plan Update, 2005, v.3.

Delta Levee Types Summary – Applications, Descriptions, and Costs (in order of increasing strength)

Land Use/ Levee Use	Levee Class	Levee Descriptive Name	Present Occur- rence (miles)	Upgrade Needed (miles)	Description/Design Basis	Application Notes	Technical Characteristics ^a	Cost per Mile (Millions of 2005 \$)				
								Basic Cost ^b	Add for Ecosystem Friendly ^c			Add for One Foot of Sea Level Rise ^d
									<i>Vegeta- tion</i>	<i>Bench</i>	<i>Setback</i>	
<i>Wetlands</i>	<i>W-1</i>	<i>Wetlands - Interior</i>	Unknown, includes much of Suisun & Cache/Yolo	New or Upgrade, Unknown	-- Economical; no design standard. -- Used to manage water flow and drainage in areas that can tolerate flooding.	-- Used for habitat and some agricultural (pasture, rice, some annual crops) – e.g., Suisun Marsh & Yolo	Typical height is less than 5 feet. Crest width is 8 feet or less. No seismic capability. Expect frequent failure.	0.1	Included	N/A	N/A	N/A
<i>Wetlands</i>	<i>W-2</i>	<i>Wetlands - Exterior</i>	Unknown, Includes Suisun Bay & Sloughs 100+/-	New or Upgrade, Unknown	-- Economical; no design standard. -- Used for limited protection of areas that can tolerate flooding.	-- Used to opportunistically protect habitat and some agricultural – e.g., Suisun Marsh.	Typical height is less than 8 feet. Crest width is 12 feet or less. Exterior & interior slopes, assume 2H:1V No seismic capability. Freeboard varies; expect frequent failure.	For new levee is 0.2 to 0.3. Upgrade is less.	Included	N/A	N/A	0.05
<i>Agriculture, Infra- structure</i>	<i>A-1, I-1</i>	<i>Hazard Mitigation Plan (HMP)</i>	600+/-	In Delta = 100+/- ?Policy? ?Include Suisun Bay Edge?	-- Qualifies levee maintaining agency to receive FEMA Disaster Assistance for levee repair if a Delta levee fails. -- Based on agreement among FEMA, State, and Delta Reclamation Districts after 1983 and 1986 floods.	-- Agriculture, habitat -- Not adequate for long-term flood protection	16 foot crest width All-weather patrol road. Steep exterior slope (1.5H:1V) Steep interior slope (2H:1V) Marginal static stability (FS = 1.1+/-) No seismic capability Freeboard = 1.0 foot (for water level with 1% annual frequency or 100-year flood)	Upgrade from existing 0.45. New levee (Suisun) would be more.	Included	N/A	N/A	0.1
<i>Agriculture, Infra- structure</i>	<i>A-2, I-2</i>	<i>Corps Public Law 84-99 (Delta Specific)</i>	366 project plus 28 non- project	?Policy? Nearly all Delta except urban or seismic? 400 to 600	-- Qualifies levees for Corps of Engineers Emergency Assistance and Rehabilitation. -- For new projects, include upgrades to meet DWR Bulletin 192-82 agricultural design. -- For infrastructure – non-seismic design (flood control, navigation, highways, railroads, pipelines, electrical and gas facilities).	-- Not adequate long-term for populated areas. -- Used for agriculture (including permanent crops), infrastructure, and water conveyance. -- Would also meet HMP requirements. -- This is the CalFed base level protection.	16 foot crest width All-weather patrol road Exterior slope (2H:1V) Interior slope (2H:1V to 5H:1V), based on levee height and depth of peat. Static stability (FS = 1.25) Levee toe drain 30 feet landward. Essentially no seismic capability. Freeboard = 1.5 feet (for 1% annual frequency or 100-year flood).	Upgrade – For 10 ft of peat 1.3 to 1.8. For thicker peat, up to 3.5. Per MBK 0.7 to 2.0.	Included	Add: 1.0 to 2.0	Change to setback: 2.0 Add to setback: 0.5 to 1.0	0.2
<i>Populated Areas (more than 1,000 people)</i>	<i>U-1</i>	<i>Populated Area (per FEMA National Flood Insurance Program)</i>	Before FEMA remap, 110+/- After remap, 50+/-	?Policy? For areas with existing population >1,000 = 200+/-	-- FEMA Flood Insurance Remapping qualifies protected area for removal from 100-year floodplain and release from flood insurance requirement. -- Provides protection from 100-year water level, with 3 feet of freeboard; is anticipated to require stronger embankments and less seepage than before remapping. -- New upgrades will be to 200-year protection per State law and other DWR Bulletin 192-82 urban design criteria (see U-2 below).	-- Substantial populations. -- Dense to high-density urban, critical (compact) infrastructure. -- Qualifies levees for Corps emergency assistance and rehabilitation. -- Would also meet HMP requirements.	16 foot crest width. All-weather patrol road. Toe drain. Exterior Slope (2H:1V) Interior Slope (varies, stability/seepage, 3 H:1V to 5H:1V). Static stability (FS = 1.4 to 1.9). Seepage exit gradient </= 0.5. (FS and Seepage per Corps documents) Very little seismic capability. Freeboard = 3.0+ feet (for 1% annual frequency or 100-year flood).	For 10 ft peat, 9.1 For special local conditions may be 4.0 or less	Included	Add: 1.0 to 2.0	Change to setback: 2.0 Add to setback 0.5 to 1.0	0.2

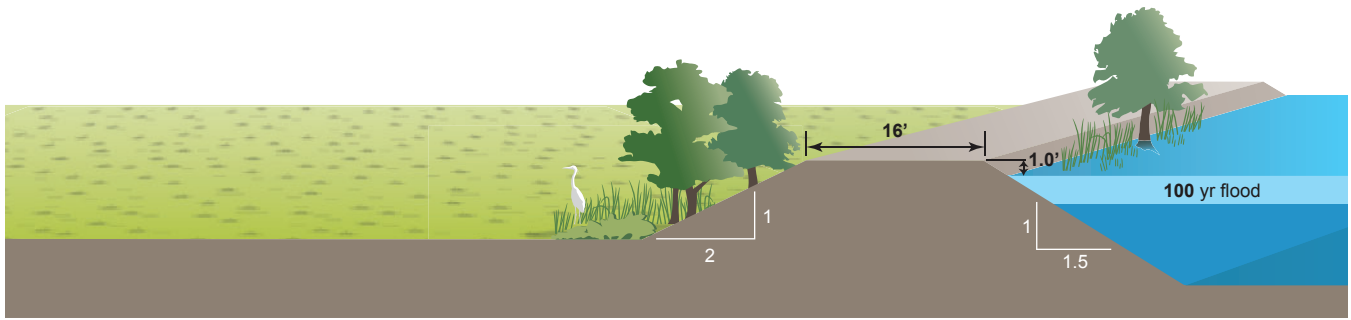
Notes:
^a These are the most significant differences. ^{b-d} All cost estimates are from the DRMS “Levee Optimization Group.”
^b Basic cost is cost to upgrade from prevalent non-compliant type – e.g., nearly HMP to really HMP, HMP to PL 84-99, etc; assumes peat thickness of 10 feet; costs are higher for thicker peat. These costs assume barrier is a levee. If a floodwall is needed, costs go higher.
^c Additional cost (if any) to upgrade to an ecosystem friendly configuration, including such components as landscaping soils, tidal zones, flood plain areas, and plantings.
^d Additional cost to add one foot to levee crest elevation in anticipation of sea level rise, without decreasing static factor of safety.

Delta Levee Types Summary – Applications, Descriptions, and Costs (in order of increasing strength) (continued)

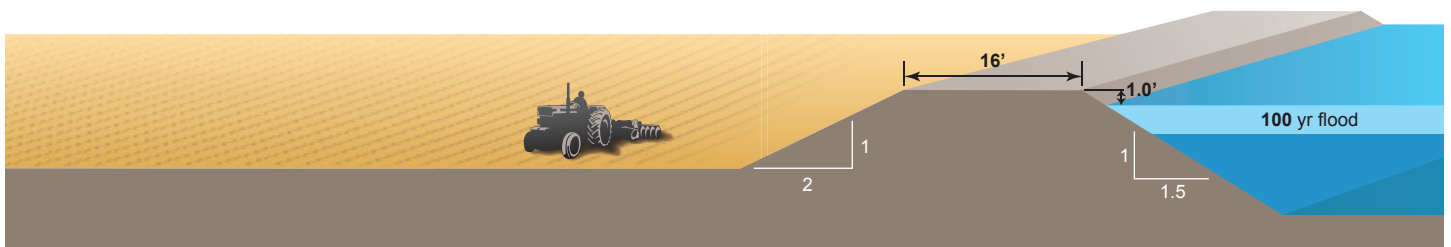
Land Use/ Levee Use	Levee Class	Levee Descriptive Name	Present Occur- rence (miles)	Upgrade Needed (miles)	Description/Design Basis	Application Notes	Technical Characteristics ^a	Cost per Mile (Millions of 2005 \$)				
								Basic Cost ^b	Add for Ecosystem Friendly ^c			Add for One Foot of Sea Level Rise ^d
									Vegeta- tion	Bench	Setback	
<i>Populated Areas (>1,000)</i>	<i>U-2</i>	<i>DWR Urban & 200 Year</i>	None	200 +/-	On top of Corps PL 84-99 and FEMA FIP, meet all DWR Bulletin 192-82 and the state law requirement for 200 year design	Like U-1 but improved design and higher level of protection	Freeboard = 3.0+feet (for 0.5% annual frequency or 200-year flood).	Less than 1.0 more than for U-1	Included	Add 1.0 to 2.0	New set-back 2.0 Add to setback 0.5 to 1.0	0.2
<i>Populated Areas (>1,000 or historic)</i>	<i>U-3</i>	<i>Delta Towns</i>	None	6 towns @ 3 to 5 = 20 to 30	On top of U-2 (above), consider extra flood protection and seismic design because of life safety due to deep flooding.	Like U-2 but will occur in the Primary Zone, often with deep peat and loose sand.	May require ring levees, floodwalls or other special features due to space constraints. Tend to be close to existing levee and water.	Widely variable based on situation	Included	N/A	N/A	0.2 plus more, depending on design
<i>Infra-structure</i>	<i>I-3a</i>	<i>Seismic Fail/Repair</i>	None	Depends on Policy or Scenario	-- Don't treat, or minimally treat, soft foundation and existing embankment; add mass to existing embankment so it doesn't slump to a below-water-line crest elevation and one has a platform for repairs after an earthquake. (Ray Seed idea for through- Delta conveyance.)	-- This design would be used only for levees along a through-Delta water conveyance. In any other circumstance where a seismic design is indicated (urban or infrastructure), one would address the foundation at increased cost to achieve better seismic performance.	16 foot crest width All-weather patrol road; toe drain Exterior Slope (3H:1V and 5H:1V) Interior Slope (3H:1V and 10H:1V) Static stability (FS = 1.8 to 2.1) May slump up to 5 feet in design earthquake (200-year earthquake). Some breaches expected. Freeboard = 3.0+ feet (for 1% annual frequency or 100-year flood)	For 10 ft peat 21.1 For thicker peat, up to 28.1	Included	Bench is Included: Up to 2.9 additional for ecosystem features	Setback is Included: Up to 2.9 additional for ecosystem features	0.2
<i>Infra-structure, Populated Areas (>1,000)</i>	<i>I-3b U-4b</i>	<i>Seismic No Fail, Minimal Slump</i>	None	Depends on Policy or Scenario	-- Seismically resistant design -- No fail/minimal slump. -- Treat soft foundation, provide engineered embankment. -- Water Contractors require this for through Delta water conveyance, per Dennis Majors.	-- Satisfy HMP, Corps, NFIP. -- Use for high-density urban, highly critical infrastructure, or water conveyance. -- Qualifies protected area for removal from 100-year floodplain. -- Qualifies for FEMA disaster assistance -- Qualifies for Corps emergency assistance and levee rehabilitation.	16 foot crest width All-weather patrol road; toe drain Exterior Slope (3H:1V and 5H:1V) Interior Slope (3H:1V and 10H:1V) Static stability (FS = 1.8 to 2.1) Dynamic stability (Ky = 0.15 to 0.27) Foundation and levee prepared, treated or compacted to resist liquefaction. May slump up to 1 foot in design earthquake (200-year earthquake). Freeboard = 3.0+ feet (for 1% annual frequency or 100-year flood)	For 10 ft peat 21.1 to 38.0 For thicker peat, up to 63.5.	Included	Bench is Included: Up to 3.1 additional for ecosystem features	Setback is Included: Up to 3.1 additional for ecosystem features	0.2
<i>Infra-structure, Populated Areas (>1,000)</i>	<i>I-3c U-4c</i>	<i>Seismic Super Levee</i>	20+/-	Depends on Policy or Scenario	--Has good foundation, engineered embankment, wide crest, houses on levee. -- Stewart Tract "River Islands"& Bethel Islands "Coves" Projects. -- For Infrastructure, raised infrastructure corridor.	-- Same notes as above for Seismically Resistant. -- Used for new, high budget, urban and subdivision development.	Wide crest (as much as 200 feet). All weather road(s) on crest. Other design factors similar to seismically resistant above. Cost estimates do not cover deep peat, extensive loose sand layers, levees over 20 feet, or non-local borrow.	6 to 12 -- little peat & sand, short levee height (10 to 20 ft), use of local borrow	Included	Add: 1.0 to 2.0	Change to setback: 2.0 Add to setback 0.5 to 1.0	0.4

Notes:
^a These are the most significant differences. ^{b-d} All cost estimates are from the DRMS "Levee Optimization Group."
^b Basic cost is cost to upgrade from prevalent non-compliant type – e.g., nearly HMP to really HMP, HMP to PL 84-99, etc; assumes peat thickness of 10 feet; costs are higher for thicker peat. These costs assume barrier is a levee. If a floodwall is needed, costs go higher.
^c Additional cost (if any) to upgrade to an ecosystem friendly configuration, including such components as landscaping soils, tidal zones, flood plain areas, and plantings.
^d Additional cost to add one foot to levee crest elevation in anticipation of sea level rise, without decreasing static factor of safety.

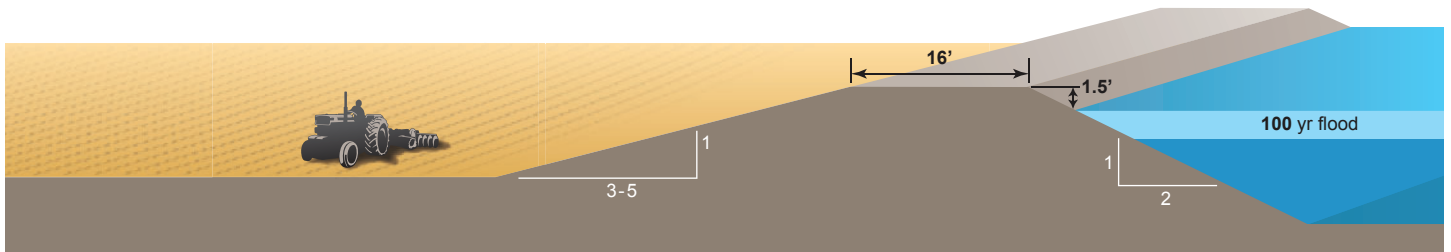
Delta Levee Types and Land Uses (in Development)



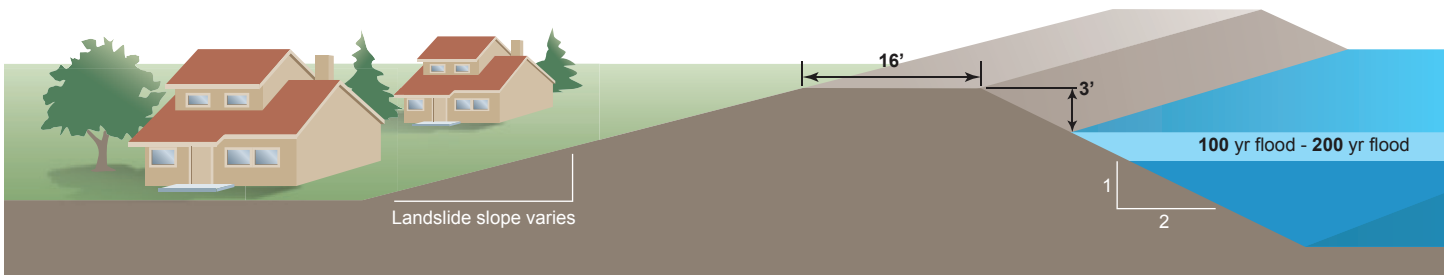
Class 1: Wetlands/Habitat



Class 2: Hazard Mitigation Plan

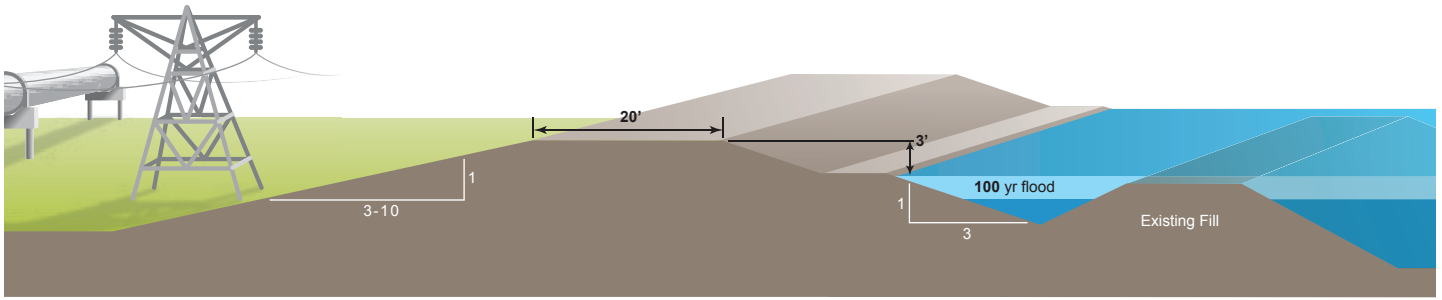


Class 3: PL 84-99

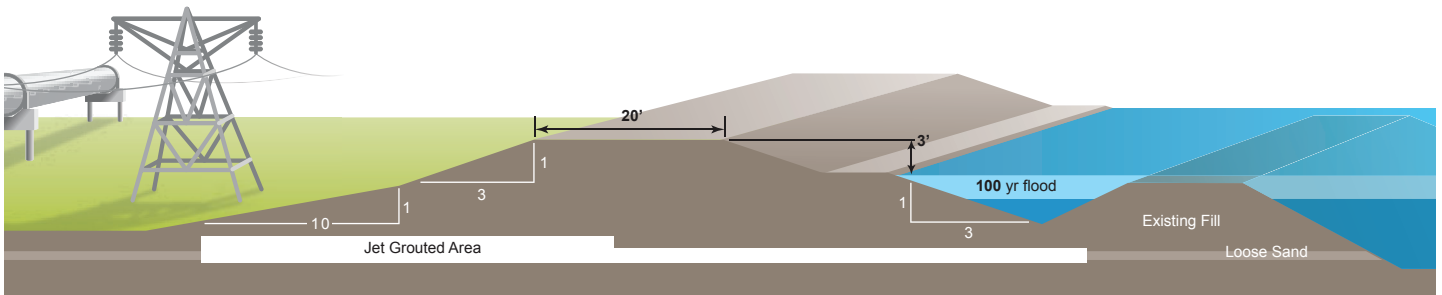


Class 4: (FEMA - 100 year) and Class 5: (FEMA - 200 year)

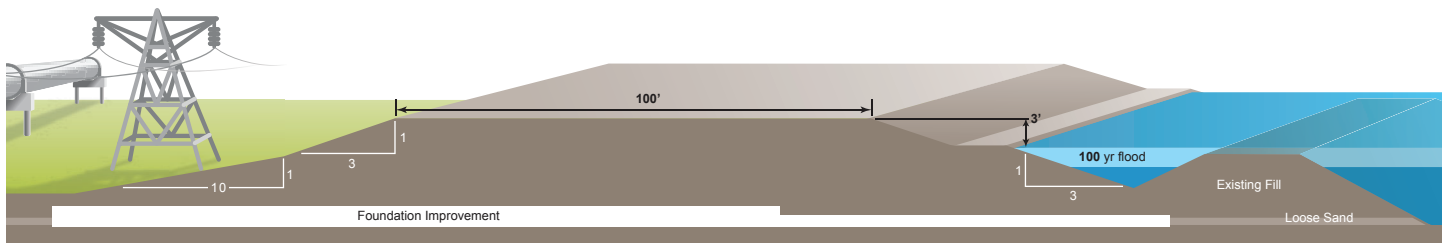
Delta Levee Types and Land Uses (in Development)



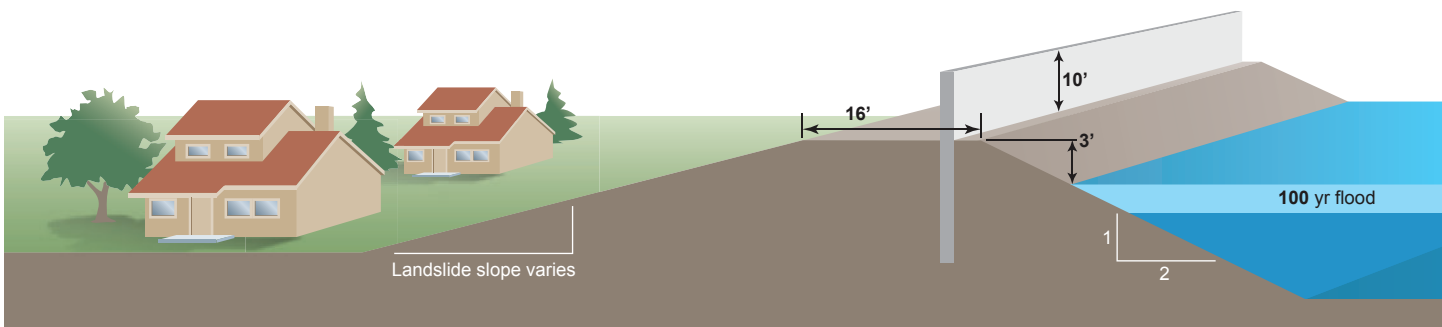
Class 6: Seismic - Fail/Repair



Class 7: Seismic - No Fail



Class 8: Seismic Super Levee



Floodwall

COMPREHENSIVE CO-EQUAL PROGRAM

Achieve Measurable Co-equal Goals



Figure 2-9: Four Possible
Futures for the Delta

Conceptual outcomes to Delta change

	No preparation	Preparation
Small externally driven changes	Status quo (problematic)	Controlled transformation (reduced risks)
Large externally driven changes	Uncontrolled transformation (potentially disastrous)	Managed transformation (large avoided costs)